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THE
INDIGENOUS GRASSES
OF
NEW ZEALAND.

ILLUSTRATED BY
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Parts V. and VI., 21 Plates.—(Complete in Six Parts.)

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GENUS XX.—GLYCERIA, R. Brown.

SPIKELETS few, several-flowered, pedicellate in a narrow or contracted panicle. *Empty glumes* unequal, obtuse or acute, awnless. *Flowering glumes* imbricated, obtuse, awnless. *Palea* nearly as long as the glume. *Scales* 1—2, connate. *Stamens* 2—3. *Grain* glabrous, free. DISTRIBUTION OF GENUS: TEMPERATE REGIONS OF THE NORTHERN AND SOUTHERN HEMISPHERES. *Etymology*: From the Greek word “glyceros,” sweet.

1.—GLYCERIA STRICTA.

SWEET GRASS.

(Plate XLI. A.)

GLYCERIA STRICTA. Hook. fil., Fl. Tasm., II., 123, t. 162B.

GLYCERIA STRICTA. Hook. fil., Fl. N.Z., I., 304.

GLYCERIA STRICTA. Hook. fil., Benth., Fl. Austral., VII., 658.

POA SYRTICA, F. Muell. Trans. Vict. Inst., 1855, 45.

FESTUCA SYRTICA, F. Muell. Fragm., VIII., 130.

GLYCERIA STRICTA. Hook. fil., Hand. N.Z. Flora, I., 336.

AN erect, tufted, glabrous grass. *Flowers* December—March. Perennial. *Culms* 4—24 inches high. *Leaves* shorter than the culms, 2—6 inches long, very narrow, involute; *sheaths* large, striate; *ligule* short, broad. *Panicle* 2—6 inches long, *branches* erect, whorled, lower longest, spreading when in flower. *Spikelets* few, 5—10 flowered. *Empty glumes* very unequal, lower 1-nerved, upper 3-nerved. *Flowering glume* obtuse, 5-nerved, none of the nerves reaching the top. *Scales* obliquely ovate, acute. *Grain* linear. DISTRIBUTION OF SPECIES: AUSTRALIA, TASMANIA, NEW ZEALAND.

This grass is not uncommon on the margins of littoral swamps or on sandhills near the sea, and is eaten with much relish by all kinds of stock, the juicy sweetness so characteristic of the genus proving so strong an attraction for sheep, that in many places they prevent it from flowering, so that it is often overlooked by collectors. It is, no doubt, a grass of much value, but is not worth the trouble of cultivation, more especially as a superior introduced species of the same genus, *Glyceria fluitans*, is spreading abundantly in swampy places, and can easily be propagated by inoculation. DISTRIBUTION

IN NEW ZEALAND: NORTH ISLAND: HICKS BAY, AUCKLAND; EVANS BAY, WELLINGTON—Buchanan; TITIRANGI, AUCKLAND—Cheeseman; AUCKLAND ISTHMUS and WAIHEKI ISLAND—Kirk; EAST COAST—Colenso. SOUTH ISLAND: CANTERBURY—Armstrong; AKAROA—Raoul; MILFORD SOUND—Enys; DUNEDIN and CLUTHA—Buchanan.

Reference to Plate XLI. A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

GENUS XXI.—CATABROSA, Palisot.

SPIKELETS panicled, shining, 2-flowered, lower sessile, upper long pedicelled. *Empty glumes* 2: unequal, shorter than the flowering. *Flowering glumes* concave, truncate, erose, awned or awnless. *Palea* 2-nerved. *Scales* 2—3. *Stamens* 3. *Grain* glabrous, free. DISTRIBUTION OF GENUS: TEMPERATE CLIMATES OF NORTHERN HEMISPHERE, CAMPBELL ISLAND, NEW ZEALAND. *Etymology*: From the Greek word “catabrosis,” a gnawing, in allusion to the erose tops of the flowering glume, as if bitten or gnawed.

1.—CATABROSA ANTARCTICA.

ALPINE WHORL GRASS.

(Plate XLI. B.)

CATABROSA ANTARCTICA. Hook. fil., Fl. Antarct., Part I., 102.

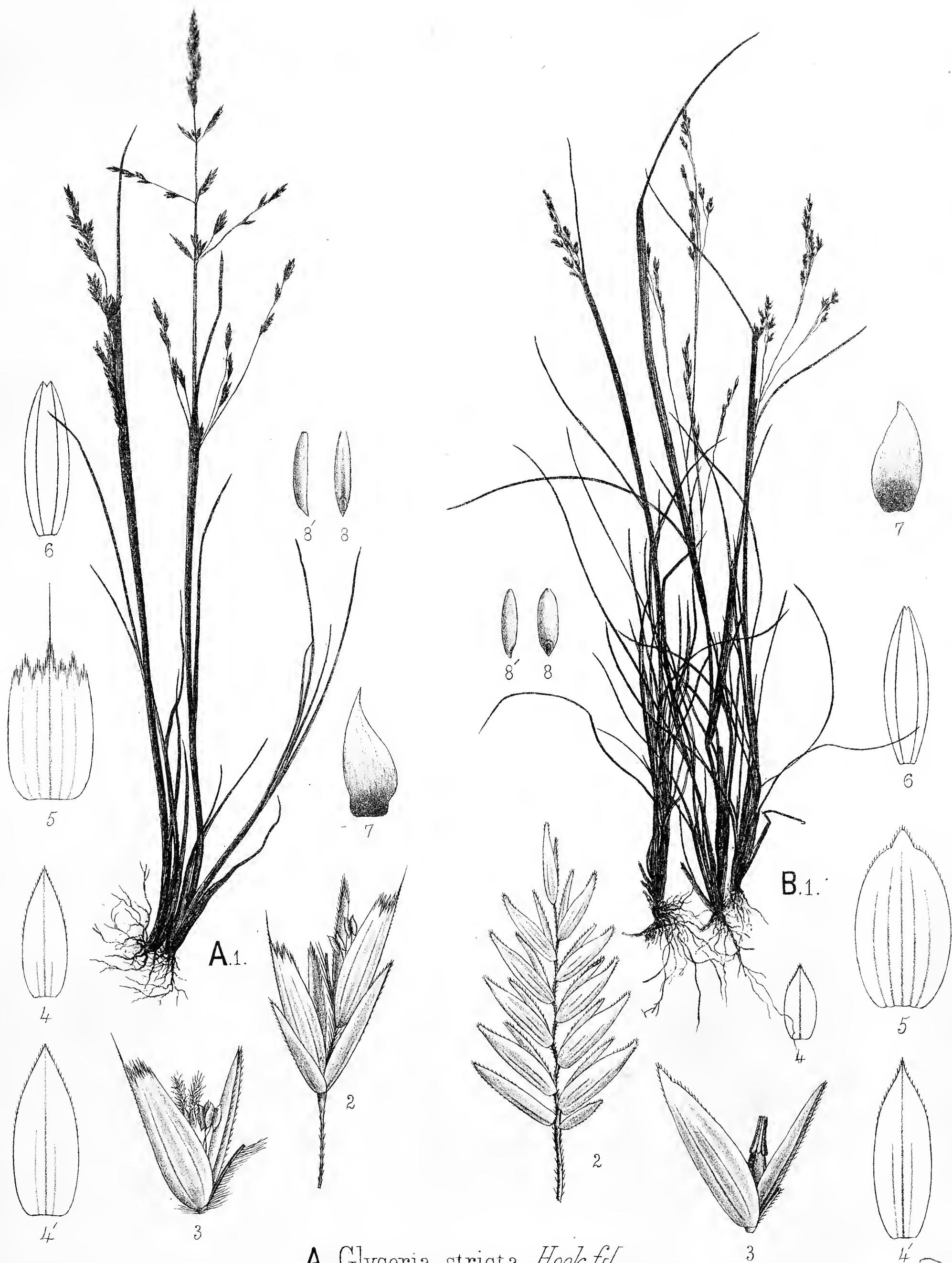
CATABROSA ANTARCTICA. Hook. fil., Fl. N.Z., I., 308, t. 56.

CATABROSA ANTARCTICA. Hook. fil., Handb. N.Z. Flora, I., 336.

A SMALL shining alpine grass, ascending to 5000 feet altitude. *Flowers* January. Perennial. *Culms* 6—12 inches high, numerous branched below, leafy. *Leaves* very narrow, involute, as long as or longer than the culms; *ligule* long, membranous; *sheaths* furrowed. *Panicle* very slender, 3—4 inches long, branches few, whorled. *Spikelets* few, small, flat, pale, shining, greenish-brown. *Empty glumes* unequal, acute, 3-nerved. *Flowering glume* erose on the truncate tips, shortly awned, 5-nerved. *Palea* nearly as long as the glume. *Anthers* broad, short. DISTRIBUTION OF SPECIES: CAMPBELL ISLAND, NEW ZEALAND.

This slender little alpine grass forms large patches of a close unmixed pasture on the Tararua and Ruahine Mountains, at an altitude of 5000 feet. It is also, according to Hooker, found in Campbell Island, on moist rocky ledges, at 1000 feet altitude. Nothing is known of its value as a pasture grass, being confined in its distribution to little-frequented localities. The representative of this genus in Britain, *Catabrosa aquatica*, is considered valuable, although not a grass of cultivation. It is aquatic in its habits, and much relished by cattle and water-fowl, being sweet and succulent. The present species may also prove worthy of attention, being succulent, and having a close habit of growth. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: RUAHINE MOUNTAINS—Colenso; TARARUA MOUNTAIN—H. H. Travers. SOUTH ISLAND: MOUNT ARTHUR—Mackay.

Reference to Plate XLI. B: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



A. *Glyceria stricta* Hook fil

B. *Catabrosa antarctica*, Hook fil

GENUS XXII.—POA, Linnæus.

Spikelets few or numerous, compressed, 1—10 flowered in a usually open panicle, with the lower branches whorled. *Empty glumes* equal or unequal, acute or acuminate, awnless. *Flowering glumes* obtuse, acute or acuminate, awnless, glabrous, scabrid or silky, naked or webbed at the base, usually 5-nerved, rarely 3 or 7-nerved, often surrounded at base, more or less, with long silky hairs, distant on a glabrous or villous rachis, which articulates between the flowering glumes. *Palea* 2-nerved. *Scales* 2, entire. *Stamens* 2 or 3. *Grain* glabrous, free. DISTRIBUTION OF GENUS: IN ALL THE TEMPERATE AND COLD REGIONS OF BOTH HEMISPHERES. *Etymology*: From the Greek word to feed, applied to pasture.

ARRANGEMENT OF THE SPECIES:

FLORETS WITH LONG FLOCCULENT SILKY HAIRS AT BASE.

Flowering glumes acute, with incurved tips. *Anthers* long.

- Panicle open; culms naked below, rigid, branched; leaves flaccid ... 1. *P. ramosissima*.
 Panicle open; culms leafy from the base; leaves coriaceous, flat ... 2. *P. foliosa*.

Flowering glumes obtuse, straight. *Anthers* long.

- Culms stout; leaves flat or concave; ligule truncate; spikelets large ... 3. *P. anceps*.
 Culms slender; leaves filiform; ligule 0; spikelets small ... 4. *P. australis*.

FLORETS WITHOUT LONG FLOCCULENT SILKY HAIRS AT BASE.

Flowering glumes acute or acuminate. *Anthers* long.

- Culms slender; leaves filiform; spikelets large; ligule membranous,
 sheathing ... 5. *P. intermedia*.
 Culms slender; leaves short, filiform; spikelets small; ligule membranous,
 sheathing ... 6. *P. Colensoi*.
 Culms slender; leaves very short, rigid, acicular; ligule membranous,
 sheathing ... 7. *P. acicularifolia*.
 Culms slender; leaves shorter than the culm, flat; ligule truncate ... 8. *P. uniflora*.
 Culms $\frac{1}{2}$ inch long; leaves very short, rigid, obtuse; ligule acuminate ... 9. *P. pygmaea*.

Flowering glumes obtuse. *Anthers* short.

- Culms slender, 1—2 inches long; leaves flaccid; short ... 10. *P. exigua*.
 Culms short, stout; leaves rigid, shorter than the culm ... 11. *P. albida*.
 Culms long, stout; leaves flat, shorter than the culm ... 12. *P. Mackayi*.
 Culms slender; leaves flat, shorter than the culm; spikelets tipped with
 purple ... 13. *P. Kirhii*.
 Culms slender; leaves very short, flaccid; flowering glume with a white
 membranous border ... 14. *P. Lindsayi*.
 Culms slender; leaves shorter than the culms; panicle green ... 15. *P. brevighumis*.
 Culms very slender; leaves much shorter than the culm; whole plant
 flaccid, green ... 16. *P. imbecille*.

1.—POA RAMOSISSIMA.

POA RAMOSISSIMA, Hook. fil., Fl. Antarct., I., 101.

POA RAMOSISSIMA, Hook. fil., Handb. N.Z. Fl., I., 338.

Culms densely tufted, forming naked, rigid, brown, branching, decumbent stems, 6—10 inches long, from which much divided, flaccid, very leafy, slender branches, 2—6 inches long, ascend. *Leaves* most numerous, very narrow, flaccid, flat, $\frac{1}{8}$ inch broad, much longer than the culms; *ligule* oblong, truncate; *sheaths* slender. *Panicle* 1—2 inches long, narrow, green; *branches* quite glabrous, smooth, very short, $\frac{1}{4}$ inch long, interrupted. *Spikelets* $\frac{1}{8}$ inch long, very shortly pedicelled, glabrous, green, 3—5-flowered. *Empty glumes* lanceolate, acuminate, 3-nerved, nearly equal, as long as the flowering, which are narrower, glabrous, acuminate with incurved tips, obscurely 5-nerved, pedicel glabrous or a little webbed. DISTRIBUTION OF SPECIES: AUCKLAND ISLANDS, CAMPBELL ISLAND.

No specimen of this grass is in the Colonial Herbarium, and it cannot therefore be figured. It has not hitherto been found in New Zealand, but, when it is considered that the large variety of *Poa foliosa* has only recently been collected on the Traps Rocks, a small group of islets south of New Zealand, it is possible that the present grass may yet be discovered on Stewart Island or adjacent rocks. Quoting from Hooker, Handb. N.Z. Flora, I., 338, "It is a grass of remarkable habit, from the long, naked, decumbent bases of the culms, which are excessively branched and leafy above."

2.—POA FOLIOSA, VAR. A.

AUCKLAND ISLANDS POA.

(Plate XLII.)

FESTUCA FOLIOSA, Hook. fil., Fl. N.Z., I., 308.

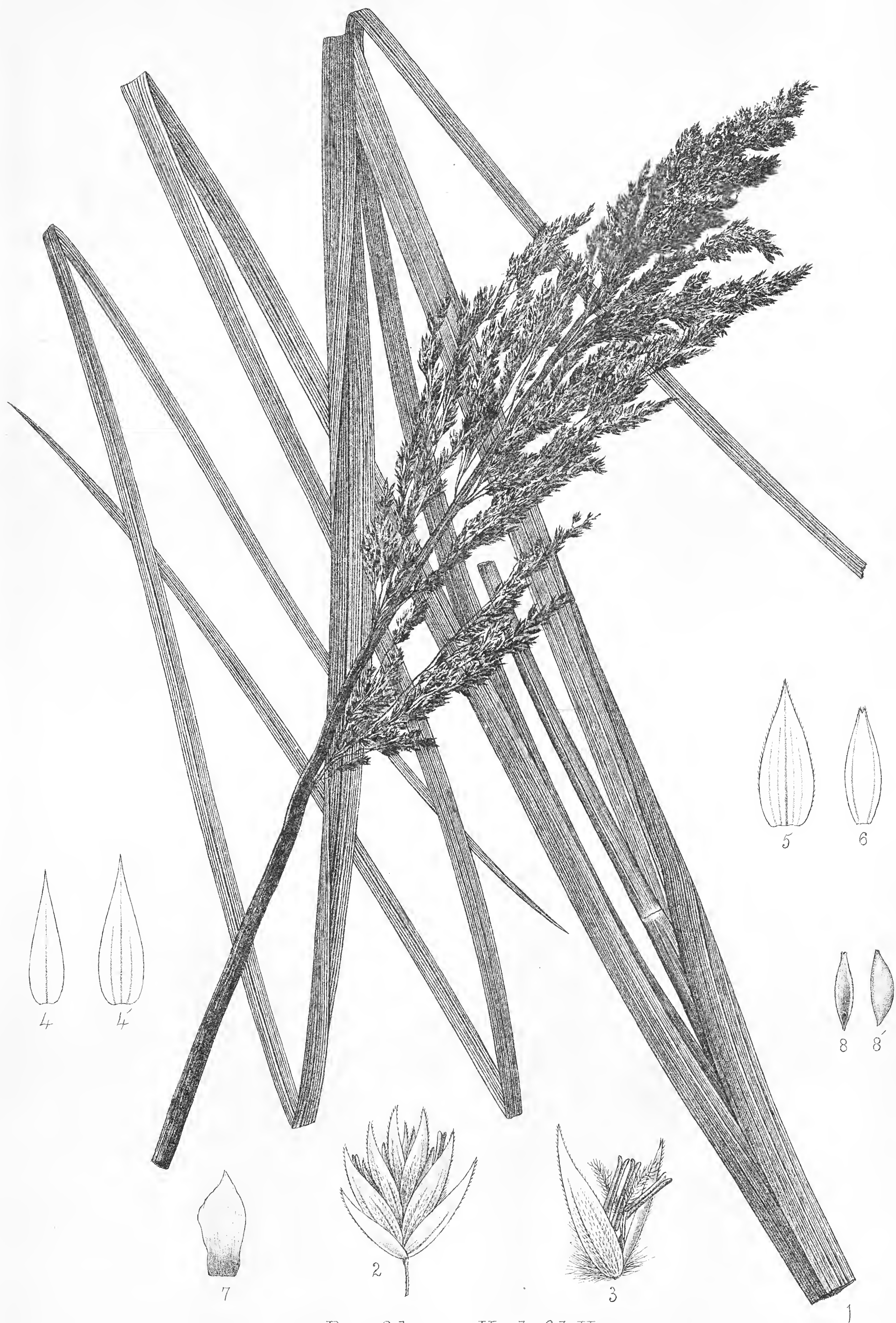
FESTUCA FOLIOSA, Hook. fil., Fl. Antarct., I., 99, t. 55.

POA FOLIOSA, Hook. fil., Handb. N.Z. Fl., I., 338.

A LARGE, littoral, tussac grass. Perennial. Culms 2—3 feet high, glabrous and finely striated. Leaves longer than the culms; flat, glabrous and striated, coriaceous, $\frac{1}{4}$ — $\frac{3}{4}$ inch broad; sheaths $\frac{3}{4}$ —1 inch broad; ligule very short. Panicle 6—10 inches long, glabrous, branches short, erect or inclined. Spikelets numerous, $\frac{1}{4}$ — $\frac{1}{3}$ inch long, compressed, 4—8-flowered, shortly pedicelled. Empty glumes 1- and 3-nerved. Flowering glume scabridous, 5-nerved, middle pair faint, tufts of long, flocculent, silky hairs at base. Anthers long. Scale oblique, acute. Grain stout, linear-oblong. DISTRIBUTION OF VARIETY: AUCKLAND ISLANDS, CAMPBELL ISLAND, NEW ZEALAND.

This variety of *Poa foliosa* was added to the New Zealand Flora, about four years ago, by Captain Johnson, of the Marine Board, who collected specimens of it on the Traps Rocks, south of Stewart Island, when on a visit there in the colonial p.s. "Luna," on public service. Captain Johnson describes these sea-girt rocks as having a rich damp guano soil, and frequented by numerous sea birds, the surface being chiefly covered with large tussacs of this grass, among which the birds nest. Hooker says of it, Fl. Antarct., I., 99, "It has a large growth and very leafy, affording a rich nutritious food for animals; in some cases it forms large mounds, or tussacs, not unlike the *Dactylis cæspitosa* of the Falkland Islands (the tussac grass), but smaller, with, however, a similarly luxuriant habit." Such a valuable grass would no doubt repay the expense of cultivation in New Zealand, and there could be little difficulty in procuring either seed or plants from the Auckland Islands, as they are occasionally visited. It might, however, be more difficult to overcome the prejudice which exists in New Zealand against all large tussac grasses, arising no doubt from an ignorance of their true value; but no experiments are necessary to establish the value of the two tussac grasses mentioned above, as they are both well known as very fattening for large stock. DISTRIBUTION IN NEW ZEALAND: TRAPS ROCKS—Johnson.

Reference to Plate XLII: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side view.



Poa foliosa Hook. fil. Var. α.

2.—POA FOLIOSA, VAR. β .

LARGE-FLOWERED POA.

(Plate XLIII. A.)

FESTUCA FOLIOSA, Hook. fil., Var. B, Fl. Antarct., I., 99.

FESTUCA FOLIOSA, Hook. fil., Var. B, Fl. N.Z., I., 308.

POA FOLIOSA, Hook. fil., Var. B, Handb. N.Z. Fl., I., 338.

A SMALL tufted, often littoral grass. Perennial. Culms 6—12 inches high, glabrous and striated, leafy at the base; sheaths $\frac{1}{4}$ — $\frac{1}{3}$ inch broad, striated; ligule very short. Leaves shorter than the culm, broad, glabrous. Panicle 2—5 inches long, branches short, erect or inclined. Spikelets large, $\frac{1}{3}$ — $\frac{1}{2}$ inch long, compressed, 4—8-flowered. Empty glumes 3-nerved. Flowering glume 5-nerved, middle pair faint and sometimes wanting, scabridous on the nerves, and with tufts of long flocculent hairs at base. Palea bifid, 2-nerved. Anthers long. Scale oblique. DISTRIBUTION OF VARIETY: AUCKLAND ISLANDS, CAMPBELL ISLAND, NEW ZEALAND.

This variety is closely allied to *Poa anceps*, var. *B*, *foliosa*, but is generally found with a more slender, drooping habit, larger spikelets, and broader leaves, the incurved tips of the flowering glumes and nervation being very inconstant. According to Hooker it is an abundant littoral grass in the Auckland and Campbell Islands and New Zealand. It has also been found at considerable altitudes, being frequently abundant in sub-alpine vegetation, and is also found growing amongst fragments of scoria on Mount Egmont, at an altitude of 7500 feet. It is an abundant and valuable grass on the mountains of Nelson, Canterbury, and Otago, and is readily eaten by cattle and sheep. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: MOUNT EGMONT (6000—7500 feet)—Buchanan. SOUTH ISLAND: MOUNT ARTHUR (4000—5000 feet)—Mackay; NELSON MOUNTAINS (4000—5000 feet)—H. H. Travers; CANTERBURY ALPS (4000—5000 feet)—Sinclair, Haast, Travers, Armstrong; OTAGO LAKE DISTRICT (3000—5000 feet)—Hector and Buchanan.

Reference to Plate XLIII. A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.

2.—POA FOLIOSA, VAR. γ .**MINUTE POA.***(Plate XLIII. B.)*

A VERY minute, tufted, alpine grass. Perennial. *Culms* 1—2 inches high, glabrous. *Leaves* $\frac{1}{2}$ —1 inch long, very narrow, involute, obtuse, acicular. *Panicle* $\frac{1}{4}$ — $\frac{1}{2}$ inch long. *Spikelets* 2—6, shortly pedicelled, compressed, $\frac{1}{5}$ inch long, 2—4-flowered. *Empty glumes* 3-nerved. *Flowering glume* glabrous, 3-nerved, and with tufts of flocculent silky hairs at base. *Palea* bifid, 2-nerved. *Anthers* long. *Scale* oblique. *Grain* linear. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This small grass appears to be rare, having only been collected in two localities. A large gap exists between this variety and the previous one, Var. B, with no apparent intermediate forms, and but for the 3-nerved flowering glume it might have been placed as a variety of *Poa anceps*, with which species it otherwise agrees in every respect. Its very diminutive size might cause it to rank as an inferior pasture grass, but, when it is considered how close sheep can graze on poor pastures, it may, where abundant on barren slopes, prove a very relishing nibble to hungry flocks. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: MOUNT EGLINTON (3000 feet)—J. Morton; MOUNT ARTHUR (4000—5000 feet)—A. Mackay.

Reference to plate XLIII. B: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



A. *Poa foliosa*, Hook fil. Var. β .
 B. " " " Var. γ .

3.—POA ANCEPS, VAR. α , ELATA.

NODDING PLUMED POA.

(Plate XLIV. A.)

POA ANCEPS, Forst. VAR. A, ELATA, Hook. fil., Fl. N.Z., I., 306.

POA ANCEPS, Forst. VAR. A, ELATA, Hook. fil., Handb. N.Z. Fl., I., 339.

A LARGE tufted or tussac grass, found at low altitudes. Perennial. *Culm* erect, stout, leafy, 2—3 feet high, glabrous, striated, compressed at the base. *Leaves* longer than the *culm*, distichous, flexuose, flat, smooth, and finely striated; *sheaths* narrow, sharply keeled on the back; *ligule* very short. *Panicle* inclined or drooping, 6—12 inches long, ovate, effuse; branches whorled, capillary. *Spikelets* numerous, $\frac{1}{3}$ —1 inch long, flat, 4—6-flowered, green, finely scabridous. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved, and with tufts of long flocculent silky hairs at the base. *Palea* 2-fid, 2-nerved. *Scale* acute or obtuse. *Anthers* long. DISTRIBUTION OF VAR. A, ELATA: NEW ZEALAND.

An abundant grass in the North Island, very variable in size. The large drooping panicle and lax leaves much longer than the culm form its best distinction from the next variety, *B. foliosa*, and its broad leaves and large spikelets from *Poa Australis*, Var. *lævis*. Often assuming the large tussacy habit of the latter species in both Islands, and affording in some districts an abundant supply of a coarse though nutritious food for horses and cattle, this is one of the larger grasses of which a considerable part is always refused by stock, through their inability to graze it, but which would be readily eaten if cut down, and cured as hay, in the flowering season. The present grass may be considered as the type of the genus in New Zealand, being connected by a gradation of varieties with all the other species. The varying form of the scale, as its growth proceeds, is very marked in the genus *Poa*. Thus, in the early stage of growth, it is very short and obtuse, and continues increasing in length and acuteness till the grain is fully formed, and it may therefore be found varying on the same panicle. DISTRIBUTION IN NEW ZEALAND: NORTH AND SOUTH ISLAND (common).

Reference to Plate XLIV. A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

3.—POA ANCEPS, VAR. β , FOLIOSA.

COMMON FIELD POA.

(Plate XLIV. B.)

POA ANCEPS, Forst. VAR. B., FOLIOSA, Hook. fil., Fl. N.Z., I., 306.

POA ANCEPS, Forst. VAR. B., FOLIOSA, Hook. fil., Handb. N.Z. Fl., I., 339.

A SMALLER tufted grass than the last, with sometimes prostrate branching stems. Perennial. Found from sea-level to 5000 feet altitude. *Culms* erect, 1—2 feet high. *Leaves* distichous, strict, shorter than the culm, $\frac{1}{10}$ — $\frac{1}{4}$ inch broad. *Panicle* contracted, 2—8 inches long, erect, branches in distant pairs, short, capillary. *Spikelets* few, $\frac{1}{4}$ inch long, flat, 3—4-flowered, finely scabridous, green. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved, and tufted at the base, with long flocculent silky hairs. *Palea* 2-fid, 2-nerved. *Scale* narrow, acute. *Anthers* long. *Grain* narrow. DISTRIBUTION OF VAR. B: NEW ZEALAND.

This is perhaps the most abundant and wide-spread grass in New Zealand, and in all the varying circumstances under which it is found retaining its distinguishing characters. It possesses a great power of adaptation to varieties of soil and climate, being often found struggling under the most adverse circumstances of poverty, on dry barren ground. From a recent collection of grasses made by Mr. A. Mackay on Mount Arthur, it appears that the maximum growth of certain grasses, among which the present is prominent, is at altitudes of 3000—4000 feet, where a temperate climate and abundant moisture prevail during summer. Under such favourable circumstances the tufted habit disappears, and a close heavy growth, 18—24-inches high, is found, which might easily be mistaken for a cultivated crop. The pasture of these upland table-lands, which are covered by snow during six months of the year, is for variety of species and bulk of growth unequalled at lower levels. This grass may be placed as one of the most valuable in New Zealand, for, although a few others may prove more nutritious, it resists better the exterminating effects of both drought and fire, thus insuring a certain amount of permanent pasture. DISTRIBUTION IN NEW ZEALAND: FOUND EVERYWHERE BETWEEN SEA-LEVEL AND 5000 FEET ALTITUDE.

Reference to Plate XLIV. B: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.





A. *Poa* *anceps*, Forst Var. *α. elata*.

B. " " Var. *β. foliosa*.

3.—POA ANCEPS, VAR. γ , BREVICULMIS.

HARD SHORT STEMMED POA.

(Plate XLV. C.)

POA ANCEPS, Forst. VAR. C, BREVICULMIS, Hook. fil., Fl. N.Z., I., 306.

POA ANCEPS, Forst. VAR. C, BREVICULMIS, Hook. fil., Handb. N.Z. Fl., I., 339.

A SMALL, prostrate, branching grass, branches ascending, found from sea-level to 3000 feet altitude. Perennial. Culms 4—6 inches high, prostrate at the base. Leaves 2—4 inches long, curving, distichous, smooth. Panicle 1—1½ inches long, ovate, contracted, smooth. Spikelets small, short, broad, 2—4-flowered. Empty glumes 3-nerved. Flowering glume 5-nerved, scabridous, and with long tufts of long flocculent silky hair at base. Palea bifid, 2-nerved. Scales oblique, acute. Anthers long. DISTRIBUTION OF VAR. C, BREVICULMIS: NEW ZEALAND.

This variety of *Poa anceps* is most prevalent on poor dry soil, being often abundant on dry gravel terraces, when under such circumstances it is of a harsh nature, and refused by stock when more succulent grasses are present. This harshness of foliage, however, in many grasses is not a proof of the absence of nutrient properties, as many such are fattening, and if cut down are readily eaten. The selection of pasture best adapted for aged sheep is of much importance, as they would be certain to fall off in condition where grasses, such as the present species, are abundant, from sheer inability to graze them. DISTRIBUTION IN NEW ZEALAND: NOT UNCOMMON IN THE DRY UPLAND PASTURES OF THE SOUTH ISLAND.

Reference to Plate XLV. C: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

3.—POA ANCEPS, VAR. δ , DENSIFLORA.

DENSE-FLOWERED POA.

(Plate XLV. D.)

POA ANCEPS, Forst. VAR. D, DENSIFLORA, Hook. fil., Handb. N.Z. Fl., I., 339.

A SMALL, erect, rigid, tufted, sub-alpine grass, found at 3000—4000 feet altitude. Perennial. *Culms* 10—20 inches high. *Leaves* 6—10 inches long, concave, rigid, acicular, glabrous. *Panicle* 2—4 inches long, ovate, dense. *Spikelets* $\frac{1}{5}$ inch long, 4—5-flowered. *Empty glumes* 3-nerved. *Flowering glumes* 5-nerved, scabridous, and with long tufts of flocculent silky hair at the base. *Palea* 2-fid, 2-nerved. *Scales* oblique. *Anthers* long. DISTRIBUTION OF VAR. D, DENSIFLORA: NEW ZEALAND.

This is apparently only a larger form of the last variety, differing principally in the tufted habit and larger inflorescence. From its harsh rigid foliage it may also be rated as of similar low value in pasture, being better adapted for large cattle than sheep. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: SUB-ALPINE LOCALITIES IN NELSON AND CANTERBURY (common).

Reference to Plate XLV. C: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.



C. *Poa anceps*, Forst. Var. γ . *breviculmis*.

D. " " Var. δ . *densiflora*.

3.—POA ANCEPS, VAR. ϵ , DEBILIS.

SLENDER POA.

(Plate XLVI. E.)

POA ANCEPS. VAR. E, DEBILIS, Kirk, M.S.

A LONG, slender, tufted grass. Perennial. *Culms* 12—16 inches high, smooth. *Leaves* longer than the culm, very narrow, slender, drooping; *sheaths* narrow; *ligule* very short. *Panicle* 4—5 inches long, inclined, branches few, in distant pairs, capillary. *Spikelets* few, $\frac{1}{4}$ inch long, narrow, 4—5-flowered, terminal near the ends of the branches. *Empty glumes* 3-nerved. *Flowering glumes* 5-nerved, finely scabridous and tufted, with long flocculent hair at the base. *Palea* bifid, 2-nerved. *Anthers* long. *Scale* oblique, acute. *Grain* narrow. DISTRIBUTION OF VAR. E, DEBILIS: NEW ZEALAND.

This very slender grass was discovered by Mr. T. Kirk, F.L.S., near the hot springs in the Auckland District, and has probably been developed there under the peculiar circumstances of heat and moisture which prevail in that locality. It has been previously shown that the conditions most favourable to maximum growth with the New Zealand species of *Poa* are under a temperate or probably severe climate, at altitudes of 4000—5000 feet: it may therefore be assumed that this weakly variety is the result of forcing. It can, however, only possess a local value, where, from its large size and succulent habit, it will be readily eaten by stock, but, from the peculiar circumstances of its forced and rapid growth, its nutrient value may be doubted. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: HOT SPRINGS, AUCKLAND—Kirk.

Reference to Plate XLVI. E: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



3.—POA ANCEPS, VAR. ζ MINIMA.

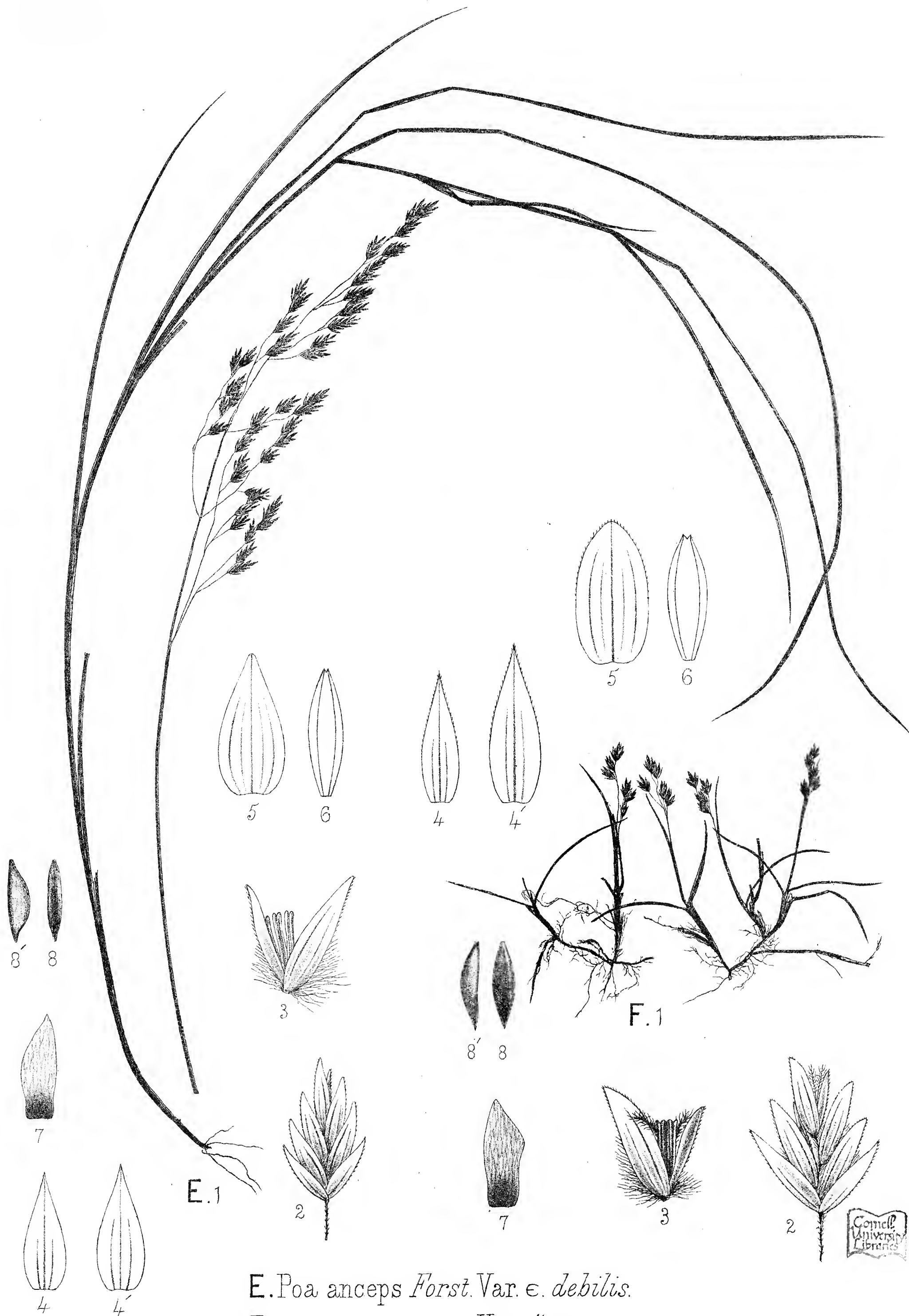
MINUTE CREEPING POA.

(Plate XLVI. F.)

A VERY small creeping-rooted grass. Perennial. Culms 1—2 inches high, smooth. Leaves few shorter than the culms, very narrow, strict, spreading sheaths, striated; ligule very short. Panicle erect, $\frac{1}{2}$ — $\frac{3}{4}$ inch long, spikelets 3—5, shortly branched. Spikelets $\frac{1}{8}$ inch long, flat, 3—4-flowered. Empty glumes 3-nerved. Flowering glume 5-nerved, finely scabridous and tufted, with long flocculent silky hair at the base. Palea bifid, 2-nerved. Anthers long. Scale oblique, acute. Grain stout, oblong. DISTRIBUTION OF VAR. F, MINIMA: NEW ZEALAND.

This peculiar, creeping, rooted little grass might almost be considered as a good species. It was discovered among the roots of larger grasses, collected by Mr. A. Mackay, on Mount Arthur, at an altitude of 4200 feet, some of which were also varieties of *Poa anceps*, and attaining an unusual size in this locality. The diminutive size of the present variety cannot therefore be ascribed to rigour of climate at this altitude, but more probably to a well-marked inherent tendency in this species to vary under all circumstances. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: MOUNT ARTHUR (4200 feet)—A. Mackay.

Reference to Plate XLVI. F.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



E. *Poa anceps* Forst. Var. *ε. debilis*.

F. " " Var. *λ. minimè*

4.—POA AUSTRALIS, VAR. LÆVIS.

TUSSAC POA.

(Plate XLVII.)

POA CÆSPITOSA, Forster. Benth., Flora Austral., VII., 651.

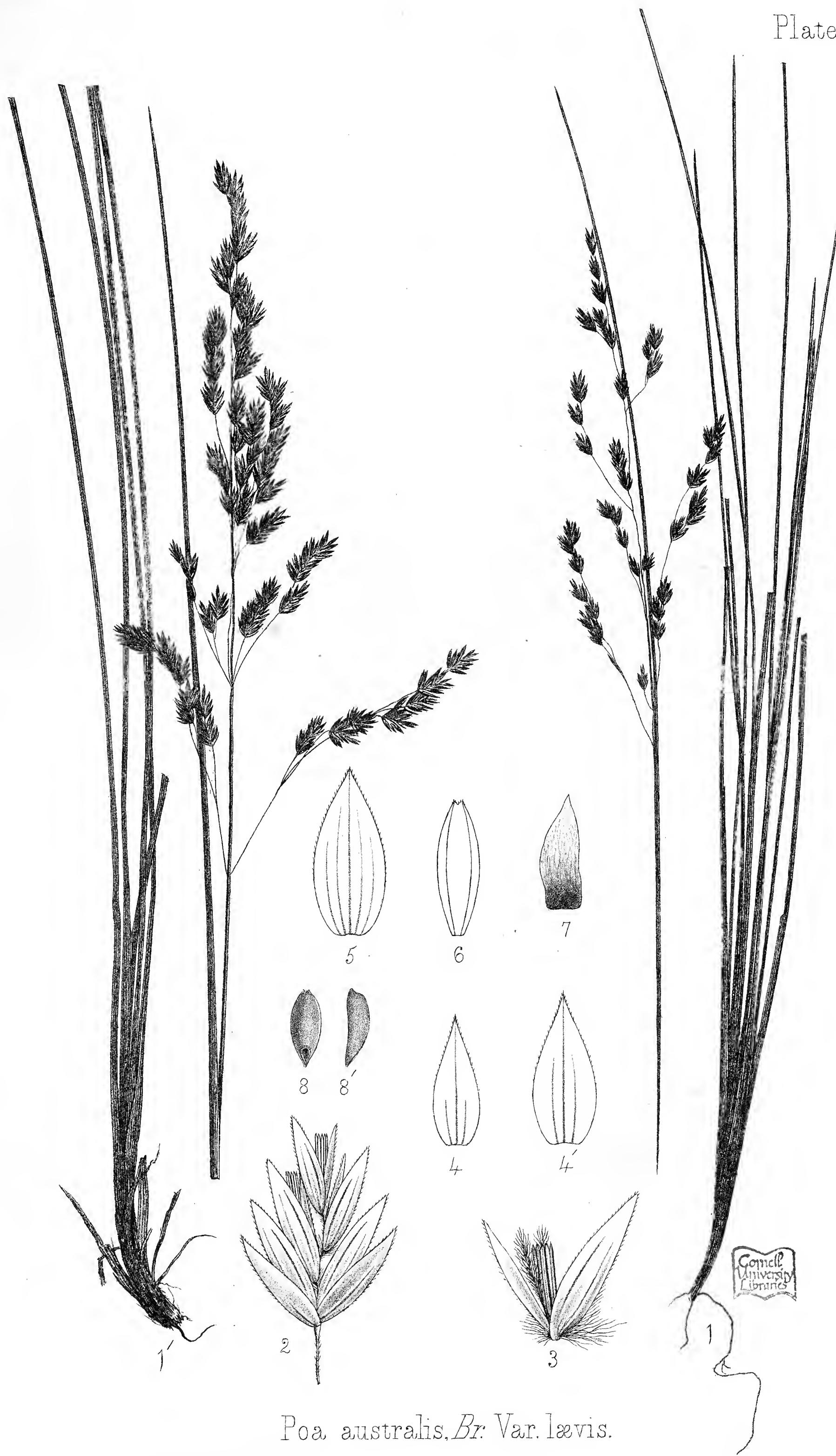
POA AUSTRALIS, R. Brown. VAR. LÆVIS, Hook. fil., Fl. N.Z., I., 307.

POA AUSTRALIS, R. Brown. VAR. LÆVIS, Hook. fil., Handb. N.Z. Fl., I., 339.

A LARGE tussac grass, from sea-level to 3000 feet altitude. Perennial. *Culms* densely tufted, 1—3 feet high, slender, smooth. *Leaves* longer or shorter than the culms, filiform, involute, rigid; *sheaths* narrow, smooth; *ligule* o. *Panicle* erect, 2—8 inches long, branches few, capillary, whorled. *Spikelets* few, scabridous, $\frac{1}{6}$ — $\frac{1}{4}$ inch long, 4—6-flowered. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved. *Palea* bluntly bifid, 2-nerved. *Scale* oblique, acute. *Grain* stout. DISTRIBUTION OF SPECIES: AUSTRALIA, TASMANIA, NEW ZEALAND.

An extremely variable grass, which has received different names by authors. It is not surprising, therefore, under such circumstances, that various estimates have been made of its value as food for stock, according to which variety prevailed in any district, some of the varieties being much more valuable than others. There is no doubt but that the true value of the larger tussac grasses, among which the present occupies a prominent place, has been much under estimated, as they have never been treated fairly on their merits, and conclusions based on the readiness with which stock eat or refuse them cannot be accepted as a criterion of their value, unless they are cut down when in flower, and treated as fodder. It is well known that even the most favourite grasses of cultivation, such as *Lolium perenne*, the common ray grass, if left uncut till the seed is shed, will be refused by all kinds of stock, and so it is with the present species, which should always be treated as a fodder plant. DISTRIBUTION IN NEW ZEALAND: COMMON IN BOTH ISLANDS, EXCEPT IN AUCKLAND NORTH.

Reference to Plate XLVII.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



Poa australis, Br. Var. *lævis*.

5.—POA INTERMEDIA, N.S.

SMALL TUSSAC POA.

(Plate XLVIII. A.)

A SMALL tufted or tussac grass, from near sea-level to 5000 feet altitude. *Flowers* December—March. Perennial. *Culms* 4—30 inches high, smooth, slender, grooved. *Leaves* as long as or shorter than the culms, erect, involute, filiform; *sheaths* grooved, with a large membranous sheathing ligule, in the tussac forms ligule small. *Panicle* ovate, 1—5 inches long, of few capillary branches, each bearing 2—6 large, elongate, flat spikelets. *Spikelets* $\frac{1}{3}$ inch long, 4—7-flowered. *Empty glumes* 3-nerved. *Flowering glume* scabridous and villous at back, 5-nerved. *Palea* 2-fid, 2-nerved. *Scales* oblique, acuminate. *Anthers* long. DISTRIBUTION OF SPECIES: NEW ZEALAND.

A valuable nutritious pasture grass, very variable in size according to soil and situation, and which is widely distributed in the South Island, and also, though less abundantly, in the North Island. In its larger tussac form it has hitherto been confounded with *Poa Australis* Br. var. *lævis*, and its numerous smaller forms with *Poa Colensoi*, Hook. fil.; always retaining, however, the open panicle and membranous sheathing ligule of the latter, with the large spikelets of *Poa anceps* varieties, thus proving its position as an intermediate species connecting this group. This grass possesses a large adaptation to circumstances of climate and soil, proving equally permanent on rich alluvial soil and on dry gravel terraces, although on the latter it is stunted and less nutritious. It is also found to attain a large size at altitudes of 4000—5000 feet, and it may, therefore, be considered as one of the most valuable permanent pasture grasses in New Zealand. It is also worthy of cultivation as fodder. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: AUCKLAND—Kirk; WELLINGTON—Buchanan; TARARUA MOUNTAINS (5000 feet)—H. H. Travers. SOUTH ISLAND: NELSON (3500 feet)—H. H. Travers; MOUNT ARTHUR (4200 feet)—A. Mackay; DUNEDIN DISTRICT, LAKE DISTRICT, AND SOUTHLAND—Buchanan.

Reference to Plate XLVIII. A.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.

6.—POA COLEN SOL.

COLEN SO'S POA.

(Plate XLVIII. B.)

POA COLEN SOL. Hook. fil., Handb. N.Z. Fl., I., 340.

A SMALL tufted grass, from near sea-level to 6000 feet altitude. *Flowers* December—February. Perennial. *Culms* 1—16 inches high, smooth, slender, grooved. *Leaves* much shorter than the culms, usually curved and straggling, involute, filiform; *sheaths* grooved, with a large membranous sheathing ligule. *Panicle* 1—2 inches long, broadly ovate, of few capillary spreading branches, each bearing 1 or 2 broad flat spikelets. *Spikelets* $\frac{1}{8}$ inch long, 3—4-flowered. *Empty glumes* 3-nerved. *Flowering glumes* ovate, acuminate, 5-nerved, scabridous, and with short hairs at the base. *Palea* 2-fid, 2-nerved. *Scales* oblique, narrow, acuminate. *Anthems* long. *Grain* smooth, linear. DISTRIBUTION OF SPECIES: NEW ZEALAND.

The New Zealand group of *Poas* having deep-rooting tufts, and among which the present species is included, occupy an important place in the pastures of New Zealand. They all possess, in virtue of this root-structure, a highly recuperative power after apparent destruction by drought or fire, which should recommend them as permanent grasses, in preference to many introduced species having surface-spreading roots, and which are better adapted for rotation crops. The grass under notice is everywhere closely cropped by all kinds of stock, and, even in the absence of any analysis, may be accepted as a grass of first-class quality. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: RUAHINE MOUNTAINS—Colenso; TARARUA MOUNTAINS—H. H. Travers. SOUTH ISLAND: NELSON—Sinclair, Munro, Travers, Kirk; RANGITATA RANGE (2000—5000 feet)—Sinclair, Haast, Kirk, Armstrong; OTAGO LAKE DISTRICT—Hector and Buchanan; DUNEDIN DISTRICT AND SOUTHLAND—Buchanan.

Reference to Plate XLVIII. B: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



7.—POA ACICULARIFOLIA, N.S.

NEEDLE-LEAVED POA.

(Plate XLIX. A.)

A SMALL, tufted alpine grass, with wiry creeping roots, at 5000 feet altitude. *Flowers* January—March. Perennial. *Culms* 3—6 inches high, very slender, capillary. *Leaves* $\frac{1}{4}$ — $\frac{1}{3}$ inch long, rigid, with acicular tips, sheaths short; *ligule* short, sheathing, membranous. *Panicle* $\frac{1}{2}$ — $\frac{3}{4}$ inch long, triangular, of 3—4 capillary spreading branches, each bearing 1 broad flat spikelet. *Spikelets* $\frac{1}{6}$ inch long, 2-flowered. *Empty glumes* ovate-acuminate, obtuse, 3-nerved. *Flowering glume* ovate-oblong, obtuse, 5-nerved, scabridous, and villous on the back. *Palea* 2-fid, 2-nerved. *Scales* oblique, acute. *Anthers* long. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This peculiar little plant has previously been considered as only a variety of *Poa Colensoi*, to which it bears a general resemblance, but differing in the short, rigid, acicular leaves, fewer-flowered spikelets, and shorter anthers, and presenting a remarkably alpine character. It may be considered as a rare plant, although pretty widely distributed, and from its short rigid foliage must rank very low as a pasture plant; it may therefore be relegated to the herbarium, as an interesting botanical curiosity. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: TARARUA MOUNTAINS (5000 feet)—J. Mitchell, H. H. Travers. SOUTH ISLAND: NELSON MOUNTAINS (5000 feet)—H. H. Travers; MOUNT ARTHUR (4200 feet) and MOUNT COOK (6000 feet)—A. Mackay; CANTERBURY MOUNTAINS—Kirk; Enys—Armstrong.

Reference to Plate XLIX. A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

8.—POA UNIFLORA, N.S.

ONE-FLOWERED POA.

(Plate XLIX. B.)

POA AFFINIS, R. BROWN. VAR. B. AGROSTOIDEA, Fl. N.Z., I., 307.

A TUFTED, glabrous, sub-alpine grass, ascending to 4,200 feet. *Flowers* December—March. Perennial. *Culms* 12—20 inches high, glabrous. *Leaves* brownish green, shorter than the culms, flat $\frac{1}{10}$ inch broad; *sheaths* striated; *ligule* long, acute. *Panicle* elongate, narrow, of few short branches. *Spikelets* small, 1-flowered. *Empty glumes* glabrous, very short, obtuse, largest 3-nerved. *Flowering glume* glabrous, elongate, obtuse, 3-nerved. *Palea* 2-fid, 2-nerved. *Scales* oblique, acute. *Anthers* long stout. DISTRIBUTION OF SPECIES: NEW ZEALAND.

The present species, recently discovered by Mr. A. Mackay, of the Geological Survey, may at once be distinguished from all other New Zealand species of *Poa*, by its one-flowered spikelets; while its bulk and succulent habit will recommend it as a valuable addition to the pasture grasses of New Zealand. Numerous specimens of several other genera were also collected at the same time, chiefly on the Mount Arthur range of mountains, at an elevation of 4000—5000 feet. In every case these specimens showed a luxuriant growth, proving the existence of a rich and varied pasture, combined with a bulk unusual at such high altitudes; several species attaining a height of 3—4 feet. The presence of a limestone formation and abundant moisture explains this remarkable growth. Such localities are, no doubt, well adapted for grazing purposes during the summer, and might even be utilized to the extent of dairy farming, as practised on the European Alps, where the cows are driven up the valleys in spring, and removed, with the produce of the season in the form of cheese and butter, on the approach of winter. Roads, however, must necessarily be formed before anything but stock for fattening purposes can be driven in such localities. DISTRIBUTION OF SPECIES IN NEW ZEALAND: MOUNT ARTHUR (4200 feet altitude)—A. Mackay.

Reference to Plate XLIX. B: Fig. 1. Plant. 2. Spikelet. 3, 3'. Nervation of empty glumes. 4. Nervation of flowering glume. 5. Nervation of Palea. 6. Scale. 7, 7'. Grain, front and side views.



A. *Poa acicularifolia*, n.s.
 B. *Poa uniflora*, n.s.

9.—POA PYGMÆA, N.S.**DWARF POA.***(Plate L. A.)*

A SMALL patch grass, rooting from the prostrate branches, found at 4000—6000 feet altitude. *Flowers* January—February. Perennial. *Culms* $\frac{1}{3}$ inch long, terminating branches 1 inch long, the latter densely clothed with short leaves. *Leaves* $\frac{1}{3}$ inch long, involute, rigid, with acicular tips; *ligule* short, truncate. *Panicle* racemose, of 1—3 spikelets. *Spikelets* large, short, broad, finely scabridous, 2—3-flowered. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved and shortly villous at base. *Palea* 2-fid, 2-nerved. *Scales* oblique, acute. *Anthers* long. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This curious little patch grass, according to Mr. Petrie, who first discovered it, is abundant on Mount Pisa, in the Lake District, Otago, at an altitude of 4000—6000 feet. It is closely allied in the structure of its inflorescence to varieties of *Poa anceps*; but the absence of flocculent silky hair at the base of the flowering glume disunites it from this group, and the dense leafy habit of the branches is entirely different from every known New Zealand *Poa*. From the short rigid growth of this grass, it can only be of value as food for sheep; and from the close structure of its branches, which peculiarly adapts it to resist the destructive effects both of frost and fire, it may prove very permanent in mountain pasturage. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: MOUNT PISA (4000—6000 feet altitude)—W. Petrie.

Reference to Plate L. A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.

10.—POA EXIGUA.

LITTLE POA.

(Plate L. B.)

POA EXIGUA, Hook. fil., Handb. N.Z. Fl., I., 338.

A VERY small tufted, glabrous, alpine grass, found at 5000—6000 feet altitude. *Culms* 1—1½ inches high; *sheaths* membranous; *ligule* short. *Leaves* involute, erect, obtuse, acicular, ½—⅔ inch long. *Panicle* racemose, ¼—⅓ inch long, of 4—8 spikelets. *Spikelets* ½ inch long, pale purple, 2-flowered, shortly pedicelled. *Empty glumes* 1-nerved and 3-nerved. *Flowering glume* roundish, with broad membranous margins, 5-nerved, finely scabridous, and shortly villous at base. *Palea* scarcely bifid, 2-nerved. *Scales* oblique, obtuse. *Grain* stout. DISTRIBUTION OF SPECIES: NEW ZEALAND.

The above description is chiefly made from a fragment of the plant originally described and named by Dr. Hooker. Additional specimens of this species have been recently collected by Mr. Petrie on Mount Pisa, Otago, at 4000 feet altitude, which differ chiefly in larger size and more numerous spikelets. A short ligule is also distinctly present in the membranous sheath. Both specimens are figured in Plate L. In its affinity this grass approaches *Poa anceps* varieties, in the short villous tufts at the base of the flowering glume, and general facies of the plant. In its larger forms it has a very close growth of soft succulent leaves, arising from prostrate branches, forming a thick short sward, and will probably prove to be a valuable sheep-grass. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: LAKE DISTRICT, OTAGO (6000 feet)—Hector and Buchanan; MOUNT PISA, OTAGO (4000 feet)—Petrie.

Reference to Plate L. A: Fig. 1, 1'. Plants. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

11.—POA ALBIDA, N.S.**WHITE-FLOWERED POA.**

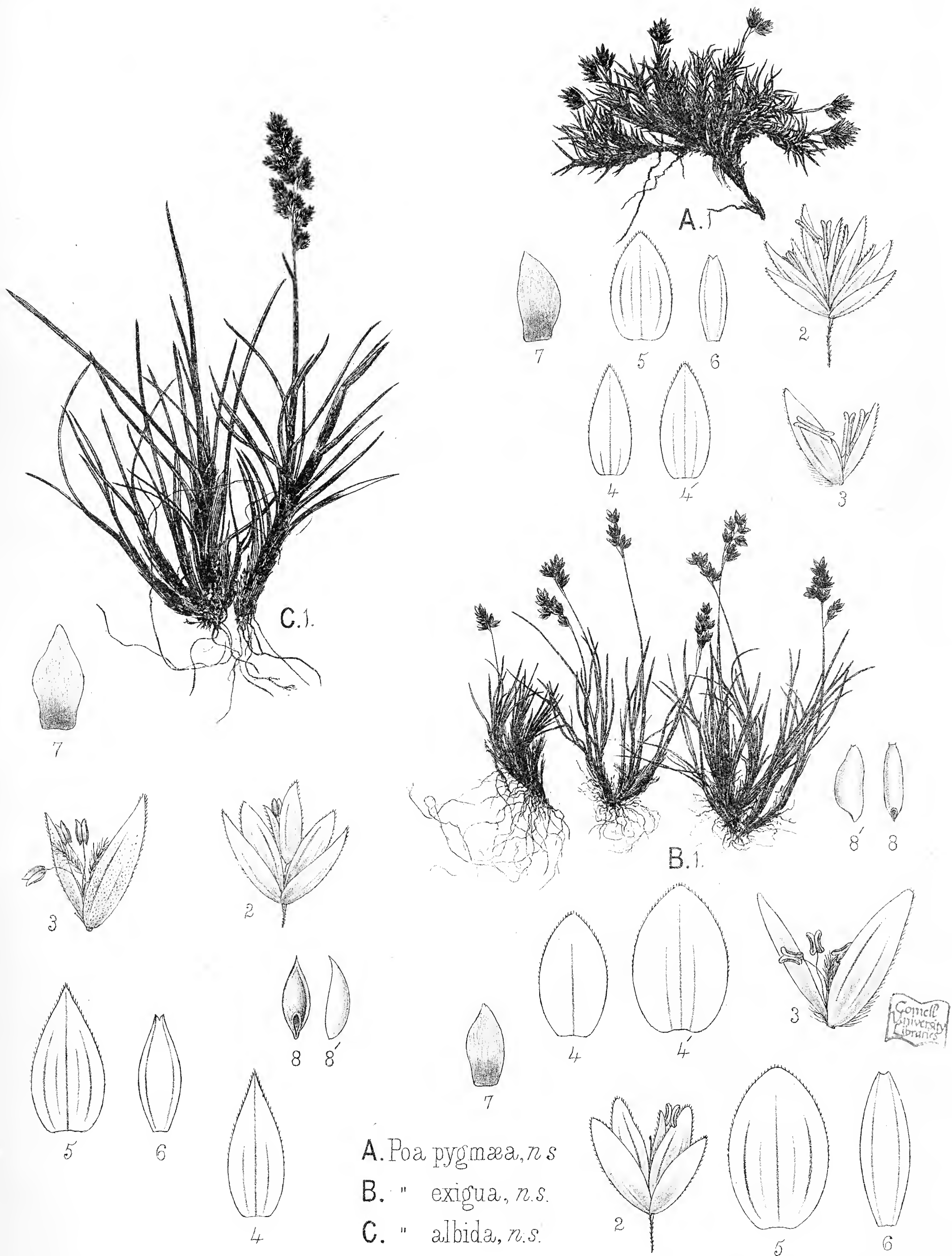
(Plate L. C.)

POA ANCEPS, VAR. E. ALPINA, Handb. N.Z. Fl., I., 339.

A SMALL tufted, deeply rooting, greenish-white grass, found at 4000—6000 feet altitude. *Flowers*—December—February. Perennial. *Culms* 4—6 inches high, smooth, stout. *Leaves* shorter than the culms, 1—2 inches long, involute, rigid, decussate, tips acicular, grooved and scabrid on the ridges; *sheaths* deeply grooved and scabrid; *ligule* short, truncate. *Panicle* much contracted, nearly white when dry, 1—2 inches long, of several short branches, densely flowered. *Spikelets* very small, short, broad, scabridous, 2—3-flowered. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved. *Palea* bifid, 2-nerved. *Scales* oblique, acuminate. *Anthers* short. *Grain* sharply pointed, and bent inward at the top. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This peculiar little alpine grass is described in the Handbook of the Flora of New Zealand as a variety of *Poa anceps*, with a note, added by the author, that “it may perhaps prove a different species.” An examination of its details confirms this opinion, and it has therefore been described as a distinct species; the long flocculent silky hair at the base of the flowering glume and long anthers, so characteristic of *Poa anceps* varieties, being both absent. The rigid, harsh herbage of this little grass does not recommend it to favourable notice, as it will probably prove unpalatable to stock. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: SNOW HOLES ON MOUNT DARWIN, ascending to 6000 feet on MOUNT DOBSON—Haast; NELSON MOUNTAINS (5000 feet)—H. H. Travers.

Reference to Plate L. C: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



A. *Poa pygmæa*, n.s.
 B. " *exigua*, n.s.
 C. " *albida*, n.s.

12.—POA MACKAYI, N.S.**BROWN MOUNTAIN POA.**

(Plate LI. A.)

A TUFTED, brownish-green, alpine grass, found at 4000—5000 feet altitude. *Flowers* January—March. Perennial. *Culms* 8—14 inches high, smooth and grooved. *Leaves* shorter than the culms, erect, flat. *Sheaths* grooved; *ligule* long, acute. *Panicle* erect, 3—4 inches long, ovate, of few branches in distant pairs, having a few large spikelets at the extremities. *Spikelets* $\frac{1}{4}$ inch long, nearly as broad, 3—4-flowered. *Empty glumes* 3-nerved. *Flowering glume* scabridous on the nerves only, tipped purple, 5-nerved, and with a small tuft of flocculent silky hair at the base. *Palea* bifid, 2-nerved. *Scale* oblique, tapering, obtuse. *Anthers* short. *Grain* long, linear. DISTRIBUTION OF SPECIES: NEW ZEALAND.

A showy grass with brownish-green leaves and purple-tipped glumes, presenting, when in flower, a very striking aspect amongst the alpine flora of the Tararua and Mount Arthur Mountains, where it is found in large patches of close-growing tufts, resembling a cultivated crop. This grass has been grown successfully in pots at Wellington by Mr. H. H. Travers, and from its bulk and succulent habit it can be recommended as a grass which would likely repay the trouble and expense of its cultivation. In a systematic point of view it connects *Poa anceps* varieties with *Poa Kirkii*, *Poa breviglumis*, and *Poa imbecilla*. DISTRIBUTION OF SPECIES IN NEW ZEALAND: NORTH ISLAND: TARARUA MOUNTAINS (5000 feet altitude)—H. H. Travers. SOUTH ISLAND: MOUNT ARTHUR RANGE (4200 feet altitude)—A. Mackay.

Reference to Plate LI. A.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

13.—POA KIRKII, N.S.

KIRK'S POA.

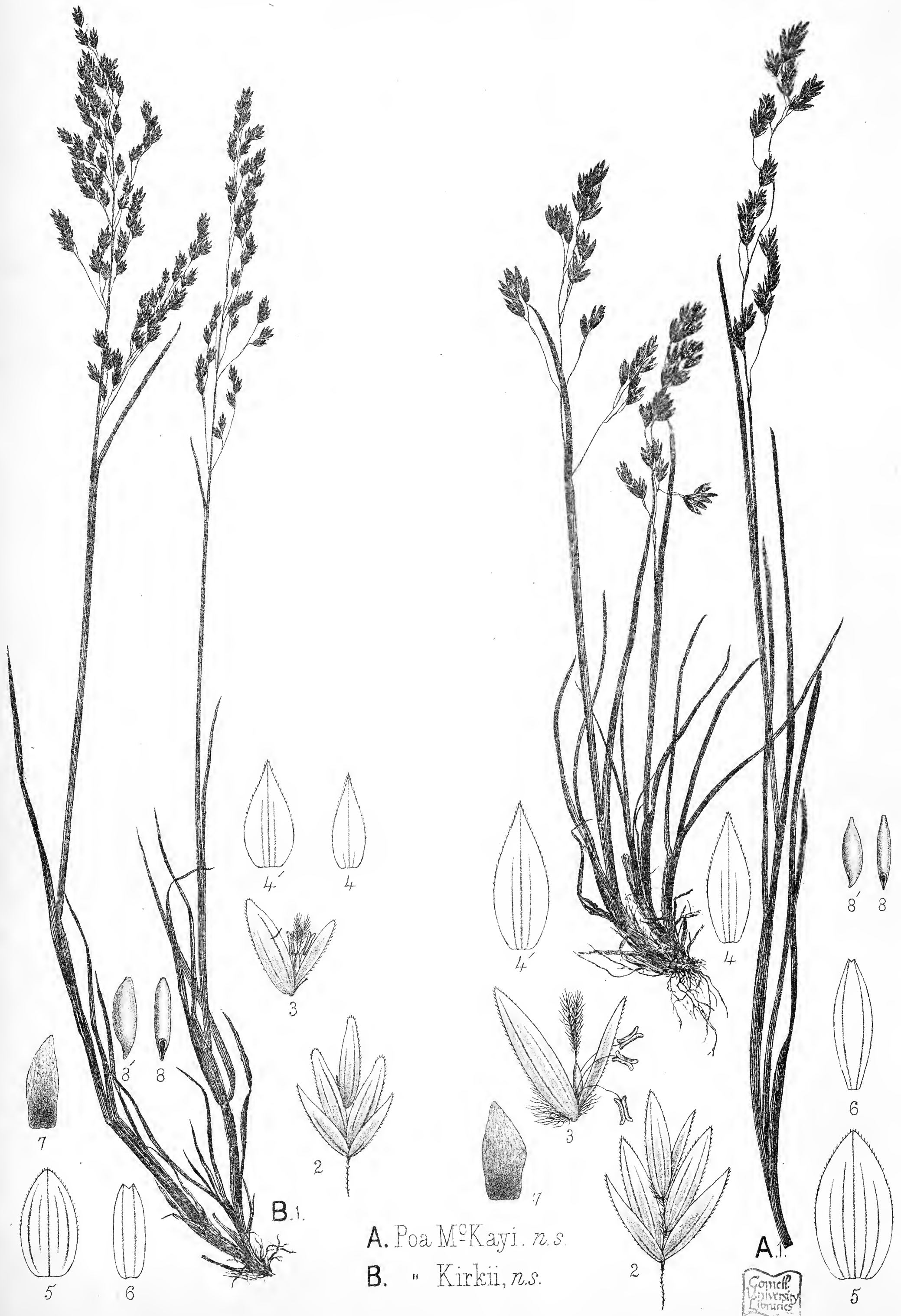
(Plate LI. B.)

POA PURPUREA, Kirk (undescribed). Trans. N.Z. Inst., IX., 500.

A TUFTED, brownish-green, alpine grass, found at 3000—4000 feet altitude. *Flowers* January—March. Perennial. *Culms* 12—14 inches high, smooth, grooved. *Leaves* shorter than the culms, erect, flat; *sheaths* grooved; *ligule* long, acute. *Panicle* erect, 3—4 inches long, ovate, branches whorled, capillary, with numerous small spikelets. *Spikelets* $\frac{1}{6}$ inch long, 3—4-flowered. *Empty glumes* 3-nerved. *Flowering glumes* very obtuse, scabridous, 5-nerved, tipped with purple, and without hairs at the base. *Palea* bifid, 2-nerved. *Scales* oblique, acuminate. *Grain* long, linear. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This species is closely allied to *Poa Mackayi* and *Poa breviglumis*, but differs much in the inflorescence from both. It is supposed to be the same grass as one first discovered on the mountains of the Clarence Valley by Mr. Kirk, but the specimens from which the above description is taken were more recently collected on the Mount Arthur Range by Mr. A. Mackay. The M.S. name originally suggested by Mr. Kirk, "*Poa purpurea*," but without any description of the plant, although appropriate as to colour, might produce confusion, inasmuch as several other species of *Poa* are also purple. Mr. Kirk says of his plant that "it is eaten alike by horses, cattle, and sheep, and appears well adapted for mixed pasturage on cool lands." DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: CLARENCE VALLEY (3000—4000 feet) — Kirk; MOUNT ARTHUR (4,200 feet) — A. Mackay.

Reference to Plate LI. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



14.—POA LINDSAYI.

BROWN-FLOWERED POA.

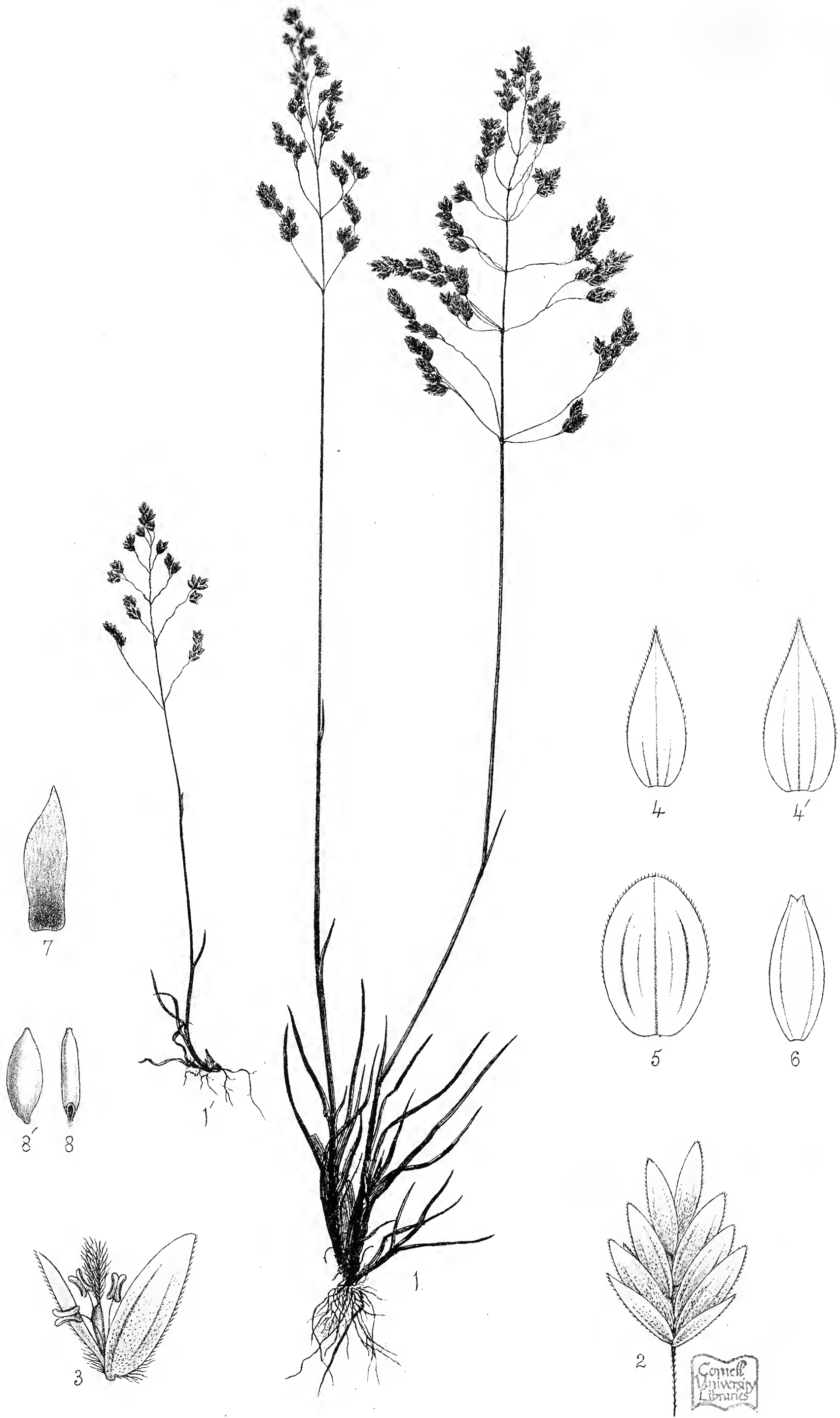
(Plate LII.)

POA LINDSAYI, Hook. fil., Handb. N.Z. Fl., I., 340.

A SMALL tufted sub-alpine grass, found from 500—4000 feet altitude. *Flowers* December—February. Perennial. *Culms* 3—12 inches high, erect, slender. *Leaves* $\frac{1}{2}$ —4 inches long, flaccid, very narrow, flat, subulate, sheathing leaves very short; *ligule* short, obtuse, or lacerate. *Panicle* ovate, open, 1—7 inches long, branches capillary, 2- or 3-nate, distant, often flexuose, lower $\frac{1}{2}$ —1 $\frac{1}{2}$ inches long. *Spikelets* few, sub-terminal on the branches, 4—8-flowered, brownish-green. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved, inner pair faint, scabridous, border membranous, sprinkled with short hairs near the base. *Palea* bifid, 2-nerved. *Scale* oblique, acute. *Anthers* short. *Grain* linear. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This beautiful little grass is abundant on the sub-alpine pasture grounds of the South Island, where, from its close tufted habit, and large capacity of seeding, it proves very permanent. This forms one of many valuable sheep grasses, which, from their small size, are little noticed except when in flower, yet but for their presence the feeding capacity of many districts would be very poor. The permanence of some of the smaller *Poas*, among which the present must be included, is most markedly shown by their increase on road cuttings, near fences, or wherever the ground is disturbed. This would indicate that a very small amount of cultivation would increase them abundantly. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: SADDLE HILL, OTAGO—Lindsay; LAKE DISTRICT—Hector and Buchanan, Petrie; ACHERON VALLEY, CANTERBURY (4000 feet)—Travers; KOWAI VALLEY (2000—3000 feet)—Haast.

Reference to Plate LII.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



Poa Lindsayi, Hook. fil.

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15.—POA BREVIGLUMIS.

SHORT-GLUMED POA.

(Plate LIII. A.)

POA BREVIGLUMIS, Hook. fil., Fl. Antarct., I., 101.

POA BREVIGLUMIS, Hook. fil., Handb. N Z. Fl., I., 337.

A SMALL tufted grass, found from sea-level to 1000 feet altitude. *Flowers* December—February. Perennial. *Culms* 10—16 inches high, erect, decumbent at the base, smooth. *Leaves* much shorter than the culms, very narrow, flat, soft; *sheaths* striated; *ligule* oblong, membranous. *Panicle* erect, 3—5 inches long, open, branches capillary, in distant pairs or ternate. *Spikelets* few, pedicelled near the ends of the branches, glabrous, green, 3—4-flowered. *Empty glumes* 1- and 3-nerved. *Flowering glume* with 5 scabridous nerves. *Palea* bifid, 2-nerved. *Scale* oblique, acute. *Anthers* short. DISTRIBUTION OF SPECIES: CAMPBELL ISLAND, NEW ZEALAND.

This species is closely allied to *Poa Kirkii*, but generally found with a much larger open panicle and smaller spikelets. When found on good soil it might easily be mistaken for a small green spikelet variety of that grass. It is a grass chiefly of maritime habits, but is also common inland on low hills. It passes insensibly into the next species, *Poa imbecilla*, by an apparent depauperation, produced by poverty of soil, but in its larger forms is a distinct species, and sufficiently bulky to constitute it a valuable grass. DISTRIBUTION IN NEW ZEALAND: COMMON IN BOTH ISLANDS IN MARITIME SITUATIONS AND ON INLAND HILLS.

Reference to Plate LIII. A.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

16.—POA IMBECILLA.

WEAK-STEMMED POA.

(Plate LIII. B.)

ERAGROSTIS IMBECILLA, Benth. Fl. Austral., VII., 643.

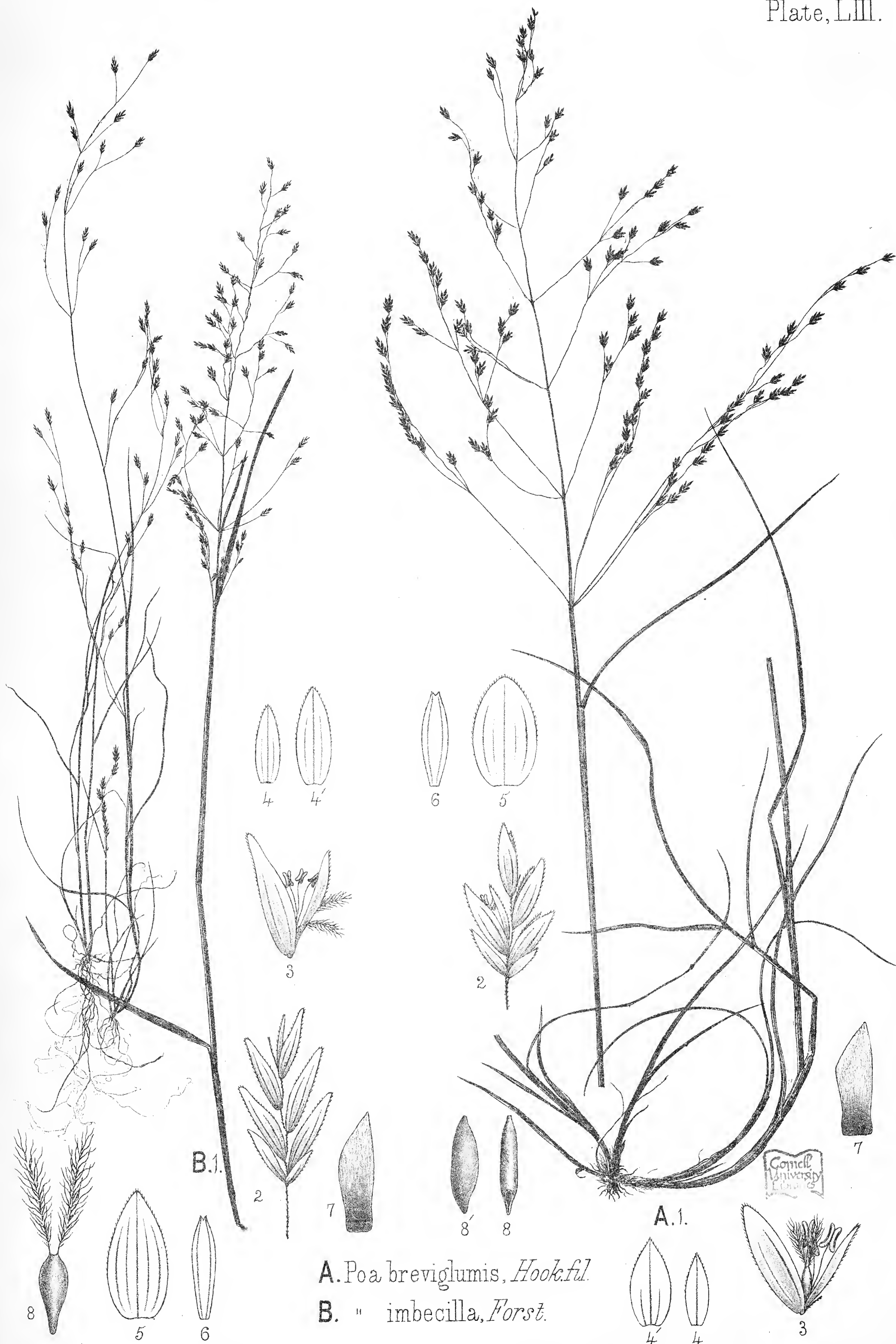
POA IMBECILLA, Forster. Hook. fil., Fl. N.Z., I., 306.

POA IMBECILLA, Forster. Hook. fil., Handb. N.Z. Fl., I., 337.

A VERY weak, slender, tufted grass, common in woods. *Flowers* November—January. *Culms* weak, decumbent, 6—12 inches long. *Leaves* very narrow, much shorter than the culms, flat; *ligule* short. *Panicle* 3—6 inches long, narrow, open, with few distant pairs or whorls of capillary branches. *Spikelets* few, pedicelled, terminal on the branches, glabrous, green, 3—8-flowered. *Empty glumes* 3-nerved. *Flowering glume* 5-nerved. *Palea* bifid, 2-nerved. *Scale* oblique. *Anthers* short. DISTRIBUTION OF SPECIES: AUSTRALIA, NEW ZEALAND.

A distinct grass from the last species in its smaller flaccid forms, but connected by varieties. It is a grass of shaded places, and has little to recommend it as a pasture plant. This grass is one of a small group allied to *Poa anceps*, of which *Poa Mackayi* forms the connecting link. It might have been more systematic to have arranged this group as varieties of *Poa Mackayi*, similar to *Poa anceps* varieties, and distinguished them by the absence of flocculent silky hairs at the base of the flowering glume and short anthers; but as this has been done in the key to the species, the retaining specific names will conduce more to their easy discrimination. DISTRIBUTION IN NEW ZEALAND: NOT UNCOMMON IN SHADED PLACES IN BOTH ISLANDS.

Reference to Plate LIII. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.



A. *Poa breviglumis*, Hook. & Arndt.

B. " *imbecilla*, Forst.

GENUS XXIII.—FESTUCA, Linnæus.

Spikelets pedicelled, several-flowered, racemose, paniced, or spiked. *Empty glumes* 2, unequal, rounded at the back, bifid, awnless or awned between the lobes. *Palea* 2-nerved, nerves ciliate. *Scales* 2, notched. *Stamens* 3. *Grain* glabrous, free or adherent to the palea. DISTRIBUTION OF GENUS: TEMPERATE AND MOUNTAINOUS REGIONS OF BOTH HEMISPHERES. *Etymology*: A Latin name of doubtful derivation.

1.—FESTUCA LITTORALIS, VAR. TRITICOIDES.

SAND-HILL FESCUE GRASS.

(Plate LIV.)

ARUNDO TRIODIODES, Trinius. Spec., Gram., t. 51.

POA LITTORALIS, Labill. Pl. Nov. Holl., I., 22, t. 27.

SCHENODORUS LITTORALIS, Beauv. Agrost, 99.

SCHEDONORUS LITTORALIS, Beauv. VAR. TRITICOIDES, Bentham, Fl. Austral., VII., 655.

FESTUCA LITTORALIS, R. Brown. Hook. fl., Handb. N.Z. Fl., I., 341.

A TALL, densely-tufted, littoral grass. *Flowers*—December—February. *Culms* 1—3 feet high, leafy, smooth and shining. *Leaves* erect, rigid, involute, terete, pungent, longer or shorter than the culm; *sheaths* striated; *ligule* very short. *Panicle* narrow, 3—10 inches long, branches short alternate, erect. *Spikelets* flat, ovate, $\frac{1}{2}$ — $\frac{3}{4}$ inch long, 4—8-flowered, straw-coloured. *Empty glumes* acuminate, 5-nerved. *Flowering glumes* ovate, acuminate, bifid at top, with a very short intermediate awn, 7-nerved. *Palea* bifid, 2-nerved. *Scales* deep and acutely bifid. *Grain* ovate, smooth, grooved in front. DISTRIBUTION OF SPECIES: AUSTRALIA, TASMANIA, NEW ZEALAND.

Varieties of the present species are abundant on the coasts of New Zealand, where they are of great value in assiting to bind drifting sand. The plant figured here is evidently the variety *triticoides*, Bentham, of Western Australia. This variety is probably the most common on the shores of New

Zealand, although the smaller sized species common in Eastern Australia is also found near Wellington, and probably in many other places in New Zealand. The variety *triticoides* may always be distinguished by its greater size—5-nerved empty glumes, and 7-nerved flowering glume. It must, from its superior size, be the most valuable as a sand-binder. These grasses can have little value as food plants, unless cut when they are in flower; and, although succulent at this time, are so sprinkled with sand as to be unfit for food. This is to be regretted, as all littoral grasses contain a considerable amount of soda in their sap secretions, which is invaluable to the health of stock. DISTRIBUTION IN NEW ZEALAND: ABUNDANT EVERYWHERE IN BOTH ISLANDS, ON DRIFT SANDS NEAR THE SEA.

Reference to Plate LIV.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.



Festuca (Schedonorus) littoralis, var. *triticoides*.

2.—FESTUCA SCOPARIA.

POA-LIKE FESCUE.

(Plate LV. A.)

FESTUCA SCOPARIA, Hook. fil., Fl. Antarct, I., 98.

FESTUCA SCOPARIA, Hook. fil., Fl. N.Z., I., 308.

FESTUCA SCOPARIA, Hook. fil., Handb. N.Z. Fl., I., 341.

A DENSELY-TUFTED, fine-leaved, littoral grass. *Flowers* December—February. Perennial. *Culms* 6—20 inches high, leafy, glabrous. *Leaves* filiform, rigid, longer or shorter than the culm, sheathing leaves narrow; *ligule* very short. *Panicle* $\frac{1}{2}$ —3 inches long, ovoid or narrow, elongate, branches short, erect, alternate, or the lower pair sometimes opposite. *Spikelets* green, flattened, $\frac{1}{4}$ — $\frac{1}{3}$ inch long. *Empty glumes* very unequal, 1- and 3-nerved. *Flowering glume* acuminate, 5-nerved. *Palea* nearly as long as the glume, bifid at the top, and 2-nerved. *Scale* acutely bifid. *Grain* broad, concave in front. DISTRIBUTION OF SPECIES: AUCKLAND ISLANDS, CAMPBELL ISLAND, NEW ZEALAND.

A small *Poa*-like grass, growing generally on precipitous rocks; its abundance, more or less, depending on the presence of such habitats. The large sea-green cushions, of filiform leaves of this species, are very conspicuous objects, and readily attract the attention. From the difficulty of reaching this grass, it is very improbable that it can be much grazed by other stock than sheep, for whom the fine foliage is well adapted. Under these circumstances it will chiefly possess a botanical interest. DISTRIBUTION IN NEW ZEALAND: NOT UNCOMMON ON ROCKY PARTS OF THE COAST OF BOTH ISLANDS.

Reference to Plate LV. A.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

3.—FESTUCA DURIUSCULA, LINNÆUS.

HARD FESCUE GRASS.

(Plate LV. B.)

FESTUCA DURIUSCULA, Linnæus. Hook. fil., Fl. Tasm., II., 126.

FESTUCA DURIUSCULA, Linnæus. Hook. fil., Fl. N.Z., I., 309.

FESTUCA DURIUSCULA, Linnæus. Hook. fil., Handb. N.Z. Fl., I., 341.

A TALL, slender, densely-tufted grass. *Roots* fibrous. Perennial. *Flowers* December—February. *Culms* 1—2 feet high, glabrous. *Leaves* slender, involute, filiform, or short and setaceous; *sheaths* with membranous wings; *ligule* very short. *Panicle* often unilateral, 1—7 inches long, open or contracted, branches capillary, often flexuose, lower 2- or 3-nate. *Spikelets* few, $\frac{1}{4}$ — $\frac{1}{2}$ inch long, 4—8-flowered. *Empty glumes* unequal, acute, 3-nerved. *Flowering glume* ovate, lanceolate, shortly bifid, with a central short stiff awn, scabrid on the nerves. *Palea* nearly as long as the flowering glume, bifid at the top, 2-nerved. *Scale* acutely bifid, and, in alpine forms, ciliate, ovary linear, crowned with a small glutinous patch without hairs. *Grain* linear, oblong, concave in front. DISTRIBUTION OF SPECIES: TEMPERATE REGIONS OF BOTH HEMISPHERES.

A very valuable grass, occupying a prominent place in all mountain pastures, being productive in every variety of soil, and possessing a great capacity of adaptation to both aridity and moisture. It is subject everywhere to much variation, and several of the varieties are known by other names. This tendency to vary may also be observed with this species in New Zealand, sub-alpine forms sometimes being more related to *Festuca ovina* than the present species; and it is very improbable that these varieties have been introduced, the only structural change observed in these sub-alpine forms being the presence of cilia on the scales. This species is highly commended by authors as a pasture grass. Mr. Sinclair observes of it that "it is most prevalent on light rich soils, but it is likewise always found in the richest natural pastures, where the soil is more retentive of moisture, and it is never absent from irrigated meadows that have been properly formed. It springs rather early, and the produce is remarkably fine and succulent, and withstands the effects of severe dry weather in rich natural pastures better than many other grasses." The proportional value in which this grass at the time of flowering exceeds that at the time the seed is ripe is as 7 to 3. DISTRIBUTION IN NEW ZEALAND: COMMON IN BOTH ISLANDS FROM 1000—4000 FEET ALTITUDE.

Reference to Plate LV. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Scale of sub-alpine form. 9. Section of ovary, showing glutinous patch on top.



A. *Festuca scoparia*, Hook fil.
B. " *duriuscula* Linn.

GENUS XXIV.—BROMUS, Linnæus.

Spikelets pedicelled, several-flowered, erect or drooping, paniced. *Empty glumes* rounded on the back, rigid, unawned. *Flowering glume* rounded on the back, 7-nerved, bifid at the top, and with a straight or curved awn between the lobes. *Palea* 2-nerved, ciliate on the nerves. *Scales* 2, entire. *Stamens* 3. *Ovary* narrow, obovate, and crowned on the top with a mass of glutinous hairs. *Styles* united at the base. *Grain* free, top hairy. DISTRIBUTION OF GENUS: TEMPERATE REGIONS OF BOTH HEMISPHERES. *Etymology*: From the Greek word for food, as applied to oats and other cereal grasses.

1.—BROMUS ARENARIUS.

SEA-SIDE BROME GRASS.

(Plate LVI. A.)

BROMUS ARENARIUS, Labill. Pl. Nov. Holl., I., 23, t. 28.

BROMUS AUSTRALIS, R. Brown. Prod. 178.

BROMUS ARENARIUS, Labill. Bentham, Fl. Austral., VII., 661.

BROMUS ARENARIUS, Labill. Hook. fil., Fl. N.Z., I., 310

BROMUS ARENARIUS, Labill. Hook. fil., Handb. N.Z. Fl., I., 341.

A TUFTED, densely-villous grass, of littoral habitats. *Flowers* December—February. Annual. *Culms* 3—24 inches high. *Leaves* flat, villous. *Panicle* 3—10 inches long, very broad, open, drooping, villous, branches slender, 3—5-nate. *Spikelets* green, $\frac{3}{4}$ —1 inch long, on slender pedicels, 5—8-flowered. *Empty glumes* 3—5-nerved, much shorter than the flowering, pubescent or ciliate. *Flowering glume* 7-nerved, ciliate, ovate, acuminate, bifid at the top, awn as long as the glume. *Palea* linear, bifid, ciliate on the 2 nerves, with a scale oblique, acute. *Ovary* narrow, crowned on the top with a mass of glutinous hairs. *Grain* linear, with a hard hairy scale on the top, which generally breaks off. *Styles* united at the base. DISTRIBUTION OF SPECIES: AUSTRALIA, NEW ZEALAND.

A common sea-side weed, which from its dry woolly nature is very unpalatable to all kinds of stock. The general character of the genus has little in keeping with the name *Bromus*, which indicates food, for none of the species of this family are noted as superior food plants, while some of them are considered as hurtful, if not poisonous. A few of the *Brome* species are very early grasses, and valuable for keeping stock in condition till superior but later kinds spring up. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND, COMMON NEAR THE SEA.

Reference to Plate LVI. A. : Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8'. Grain, front and side views.

GENUS XXV.—TRITICUM, Linneæus.

Spikelets spiked, solitary, distichous, and alternately sessile on a compressed rachis, 3- or several-flowered. *Empty glumes* 2, shorter than the flowering, unequal, rigid. *Flowering glume* rigid, concave, 3—7-nerved, obtuse, acute or awned. *Palea* 2-nerved, nerves ciliate. *Stamens* 3. *Ovary* crowned at the top with a glutinous mass of hairs. *Styles* apparently lateral. *Grain* grooved in front, adherent to the palea. DISTRIBUTION OF GENUS: TEMPERATE CLIMATES OF BOTH HEMISPHERES. *Etymology*: The generic name for wheat.

1.—TRITICUM MULTIFLORUM.

SHORT-AWNED WHEAT GRASS.

(Plate LVI. B.)

TRITICUM MULTIFLORUM, Banks and Sol. Hook. fil., Fl. N.Z., I., 311.

TRITICUM MULTIFLORUM, Banks and Sol. Hook. fil., Handb. N.Z. Fl.

A ROBUST, tufted, blueish-green grass. *Flowers* December—March. Annual or perennial. *Culms* erect, prostrate at the base, 1—2 feet high, striate, glabrous. *Leaves* 3—6 inches long, narrow, flat, rough on the upper surface, sheathing leaves short, striate; *ligule* 0. *Spike* 2—8 inches long. *Spikelets* 6—12- and 6—10-flowered, $\frac{1}{2}$ —1 inch long. *Empty glumes* narrow, unequal, acuminate, 3-nerved. *Flowering glume* much longer, acuminate, bifid at the top, with a very short scabrid awn, 5-nerved. *Palea* obtuse, 2-nerved. *Scale* oblique, shortly ciliate. *Ovary* crowned on the top with a mass of glutinous hairs, which hardens and scales off from the grain. *Styles* connected below. DISTRIBUTION OF SPECIES: NEW ZEALAND.

A scattered grass, seldom abundant, being generally found in distant tufts, which readily attract notice by their peculiar blueish-green colour among the darker coloured vegetation. This is a grass, when in flower, better adapted for cattle than sheep, as the stout culms and spikes offer only a coarse

herbage. As a fodder grass it would produce less bulk than its large size might suggest, as the leaves are short and soft, and the greater part of its nutrient properties would be found in the culms and spikes. This is the case, however, more or less, with every grass; but the proportion of leaves to culms, in this case, is a minimum. **DISTRIBUTION IN NEW ZEALAND: NORTH AND SOUTH ISLANDS: COMMON NEAR THE SEA AND ON INLAND HILLS.**

Reference to Plate LVI. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7, 7', 7". Varieties of scale. 9, 9', 9". Grain, front and side views, and section.



2.—TRITICUM SCABRUM.

BLUE WHEAT GRASS.

(Plate LVII.)

FESTUCA SCABRA, Labill. Pl. Nov. Holl., I., 22, t. 26.

TRITICUM SCABRUM, R. Brown. Prod. 178, Hook. fil., Fl. Tasm., II., 128.

AGROPYRUM SCABRUM, Beauv, Bentham. Fl. Austral., VII., 665.

TRITICUM SCABRUM, R. Brown. Hook. fil., Fl. N.Z., I., 311.

TRITICUM SCABRUM, R. Brown. Hook. fil., Handb. N.Z. Fl., I., 342.

A LARGE tufted blueish-green grass. *Flowers* December—March. Annual or perennial. *Culms* erect, prostrate at the base, 3—18 inches high, smooth, striated. *Leaves* 2—8 inches long, flat or involute, smooth or scabrid, sheathing leaves long, striate; *ligule* o. *Spike* 2—6 inches long. *Spikelets* 2—8, with the awn $1\frac{1}{2}$ — $2\frac{1}{2}$ inches long, 6—10-flowered, erect, alternate, scabrid. *Empty glumes* unequal, 5-nerved, much smaller than the flowering. *Flowering glume* tapering into a long awn, 3—5 times as long as the glume, 5-nerved; *awn* flexuose, straight or curved. *Palea* obtuse, 2-nerved. *Scale* oblique, or unequally bifid, ciliate. *Ovary* crowned on the top with a mass of glutinous hairs, which scales off from the grain. *Styles* connected below. DISTRIBUTION OF SPECIES: AUSTRALIA, TASMANIA, NEW ZEALAND.

An abundant grass in both Islands, from sea-level to 3000 feet altitude. It varies much in size and character, being smaller and more glabrous near the sea, and varying much in the size of the spikelets in inland districts. The species of *Triticum* are considered as annuals in New Zealand, but this must be accepted with reservation, as it is doubtful if a true annual grass exists in the Islands, the cool and moist climate of many inland localities enabling grasses to maintain a continued growth without that amount of heat-forcing which is, at all times, necessary to ripen seed the first year, for there certainly exists an inherent tendency in many grasses to flower and seed at an early stage of their growth, and before stoles are thrown out from the roots. In such cases the plant is exhausted and dies, and may be considered as an annual, although the species may be continued on the same ground from shaken seed. This is undoubtedly the theory of certain supposed perennial grasses, such as *Lolium perenne*, proving sometimes annual; and such grasses can only be secured perennial by cutting or grazing down the flowering stems for one or more years, till each seedling plant has thrown out numerous stoles from the root before ripening any seed, by which time a thick close sward has been formed. Some grasses,

again, such as *Dactylus glomeratus*, require no such attention, possessing, as they do, an inherent tendency to delay the process of flowering and seeding for some years, by which time each seed has formed a small tussac and, by their confluence, a close sward, thus proving a true perennial grass. In the South Island, the species under notice, *Triticum scabrum*, was considered by the early settlers as a good grass for horses and cattle, and was known by them as the "blue tussac grass," or "blue oat grass,"—a pardonable error in the latter name, the spikes being more like oats than wheat. A very marked variety of this species has been figured here under the name *Triticum scabrum*, var. *tenue*. This grass is abundant in some of the inland districts of Nelson and Canterbury. It is a weak elongated form, 3—4 feet long, and often trailing on the ground. Other varieties exist of less importance, varying in the size of the spikelet and amount of scabridity. All the varieties, if cut in flower, make excellent fodder grasses. DISTRIBUTION IN NEW ZEALAND: ABUNDANT IN BOTH ISLANDS.

Reference to plate LVII. A.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8, 8', 8''. Grain, front and side views, and section.

Reference to Plate LVII. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Section of ovary, showing the position of the styles.



A. *Triticum scabrum*, R. Brown.

B. " " var. *tenue*.

3.—TRITICUM YOUNGII.

TRITICUM YOUNGII, Hook. fil., Handb. N.Z. Fl.

Leaves quite glabrous below, slightly scabrid on the upper surface. *Spike* 2—3 inches long, of 3 or 4 very large spikelets 4 inches long including the awns. *Empty glumes* $\frac{1}{3}$ inch long, acuminate margins membranous. *Flowering glumes* nearly $\frac{3}{4}$ inch long without the awn, which is $1\frac{1}{2}$ —2 inches long, very stout, rigid, scabrid, concave at the back, concave in front with scabrid edges, margin and sides of glumes scabrid and almost aculeate. DISTRIBUTION OF SPECIES: MIDDLE ISLAND: GRASSY FLATS, SOURCES OF THE WAITAKI, AT 3000 FEET ALTITUDE—Haast.

There is no specimen of this grass in the Colonial Herbarium, and cannot therefore be figured. This appears to be a very rare grass, and probably confined to the district in which it was originally discovered. Hooker says of it, Handb. N.Z. Fl., I., 343, "A remarkable plant, with few spikelets, almost twice as large as those of *Triticum scabrum*, and very long rigid awns."

GENUS XXVI.—GYMNOSTICHUM, Schreber.

Spikelets spiked, sessile, alternate on a flattened rachis, 1—3-flowered. *Empty glumes* wanting or reduced to a pair of flat bristles. *Flowering glume* acute or awned, seated on a thickened callus. *Palea* 2-nerved, nerves ciliate at the back. *Scales* 2-lobed, ciliate. *Ovary* crowned on the top with a mass of glutinous hairs. *Styles* apparently remote at the base. *Grain* linear. DISTRIBUTION OF GENUS: NORTH AMERICA, NEW ZEALAND. *Etymology*: From two Greek words, “naked” and “a rank,” in reference to the absence of glumes.

1.—GYMNOSTICHUM GRACILE.

SLENDER GLUMELESS GRASS.

(Plate LVIII.)

GYMNOSTICHUM GRACILE, Hook. fil., Fl. N.Z., I., 312, t. 70.

GYMNOSTICHUM GRACILE, Hook. fil., Handb. N.Z. Fl., I., 343.

A TALL slender grass with prostrate branching stems. Perennial. From sea-level to 2000 feet altitude. *Culms* slender, 2—4 feet high. *Leaves* narrow, flat, smooth or rough; *sheaths* smooth, often membranous; *ligule* 0. *Spike* 4—8 inches long, slender, inclined, rachis flat, flexuose, edges ciliate. *Spikelets* 20—30, sessile, alternate, $\frac{1}{4}$ — $\frac{3}{4}$ inch long with the awns, 1—3-flowered. *Empty glumes* 0, or replaced by 2 persistent bristles, or narrow, rigid, 1-nerved glumes; *florets* 1—3, lower pedicelled; *upper floret* generally imperfect, each with a callus at its base. *Empty glumes* or bristles 1-nerved. *Flowering glume* 5-nerved, scabrid; *awn* short. *Palea* obtuse, ciliate at top. *Scales* 2-lobed, ciliate. *Ovary* crowned with a mass of glutinous hairs, which scales off from the ripe grain. *Styles* united at the base. DISTRIBUTION OF SPECIES: NEW ZEALAND.

A variable grass, found near bush or in sheltered places. It is usually prostrate and straggling, numerous branched, and with the leaves often springing from knotted articulations. When in flower the empty glumes are frequently absent, but they are sometimes represented by a pair of rigid-looking

bristles, which will be found, on examination of fresh specimens, to be narrow, 1-nerved, rigid glumes, having an upper and lower relative position. The peculiar gluten mass crowning the ovary, so characteristic in *Triticum*, is also present, showing a close alliance to that genus. The value of this grass in pasture must, from its rarity and straggling habit, be of little value, as it never forms a close sward, and it is also doubtful if it could be improved by cultivation. DISTRIBUTION IN NEW ZEALAND: NORTH ISLAND: WOODS AT PATEA AND TARAWERA—Colenso; AUCKLAND—Kirk. MIDDLE ISLAND: NELSON—H. H. Travers; AKAROA, Raoul; OTAGO LAKE DISTRICT—Hector and Buchanan; EAST COAST, OTAGO—Buchanan.

Reference to Plate LVIII.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Section of ovary.



Gymnostichum gracile, Hook. fil.

ADDENDA.

GENUS XII., 2.—STIPA, Linnæus.

Spikelets pedicelled, 1-flowered, paniced or sub-racemose, erect. *Empty glumes* persistent, membranous, keeled. *Flowering glume* rigid, rolled round the flower, with a terminal bent awn, spirally twisted below the bend, and articulating on the flowering glume. *Palea* and grain enclosed in the glume. *Scales* large. DISTRIBUTION OF GENUS: TROPICAL AND TEMPERATE REGIONS OF BOTH HEMISPHERES. *Etymology*: From the Greek word for tow, made from flax.

STIPA PETRIEI, N.S.

PETRIE'S STIPA.

(Plate XVII., 2.)

AN elegant tufted grass, with long wiry roots, found at 1000 feet altitude. *Flowers* December—January. Perennial. *Culms* numerous, 12—18 inches high, erect, slender, smooth, grooved. *Leaves* shorter than the culms, erect, smooth, involute, filiform. *Sheathing leaves* long; *ligule* membranous, sheathing. *Panicle* erect, 3—8 inches long, broad at the base and tapering to an acute top; *branches* filiform in distant whorls, each branch with from 2—5 terminal spikelets. *Spikelets* $\frac{1}{8}$ inch long, 1-flowered. *Empty glumes* membranous, glabrous, upper 3-nerved. *Flowering glume* shorter, rolled round the palea and seed, villous on the back, and with a short circle of hairs at base, 5-nerved, bifid at the top, with a long central bent or waved awn, which is spirally twisted near the bottom. *Palea* bifid, 2-nerved, villous or with scattered hairs on the back. *Scales* linear, very obtuse. *Anthers* long. *Grain* narrow, smooth. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This beautiful and interesting grass was discovered by Mr. Petrie on a recent visit to the Lake District of Otago, proving that much still remains to be done before the botanical treasures of these inland mountain districts are exhausted. Several grasses new to science, as also some new to New Zealand, although found previously in Australia and already described by authors, have been added to the flora of New Zealand since the publication of Hooker's Handbook of the Flora, and these discoveries should stimulate those who have opportunities of visiting the interior districts to make collections. Nothing is known of the value of this grass in pastures, but species of *Dichelachne*, to which the present is closely allied, are valuable pasture grasses. However, it is certainly worthy of cultivation as an ornamental grass. DISTRIBUTION OF SPECIES IN NEW ZEALAND: SOUTH ISLAND: CROMWELL, OTAGO, 800—1000 FEET—W. Petrie.

Reference to Plate XVII., 2: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7, 7'. Scale. 8, 8'. Grain, front and side views.



Stipa Petriei n.s.

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GENUS XIV., 2.—DEYEUXIA, Clarion.

Spikelets pedicelled, 1-flowered, paniced or spike-like, the rachis of the spikelet articulates above the 2 empty persistent glumes. *Flowering glume* membranous, with a fine dorsal awn, which is usually bent and twisted, sometimes minute, rarely wanting, tufted at base with silky hairs, and with a long pencil of hair proceeding from the terminal rachis. *Palea* membranous, half or nearly as long as the flowering glume. *Grain* enclosed in the glume and palea, free, or partially adhering. DISTRIBUTION OF GENUS: TROPICAL AND TEMPERATE REGIONS OF BOTH HEMISPHERES. *Etymology*: Name in honour of M. Deyeux, a French chemist.

DEYEUXIA SCABRA, BENTH.

AUSTRALIAN BENT GRASS.

(Plate XXVI., 2.)

AGROSTIS SCABRA, R. Br. Prod., 172. Hook. fil., Fl. Tas., II., 116, t. 160.

AGROSTIS RUDIS, Rœm. and Schult. Syst., II., 360.

CALAMAGROSTIS RUDIS, Steud. Syn. Glum., I., 192.

A CONTRACTA, F. Muell., Herb. Hook. fil., l.c., t. 161.

A DECIPIENS, R. Br. Prod., 172.

CINNA DECIPIENS, Kunth. Enum., I., 207.

DEYEUXIA SCABRA, Benth. Fl. Austral., VII., 583.

A TALL, tufted, soft-leaved grass, found at 1500 feet altitude. *Flowers* December—January. Perennial. *Culms* 1—2 feet long, smooth, weak, and decumbent at the base. *Leaves* smooth, flat, striated, flaccid, narrow, much shorter than the culms; *sheaths* striated; *ligule* short, truncate. *Panicle* 2—8 inches long, much contracted, the short capillary branches scattered, or in distant whorls of two or four. *Spikelets* shining, pale-straw colour. *Empty glumes* 3-nerved, lateral nerves very short. *Flowering glume* sharply bifid at the top, and with a central short dorsal awn, scabridous, 5-nerved. *Palea* nearly as long as the glume, trifid at the top. *Rachis* produced into a long pencil of hairs, and a circle of hairs round the base of the flowering glume. *Scale* narrow, acute. *Anthers* long. *Ovary* pubescent

on the top. DISTRIBUTION OF SPECIES: NEW ZEALAND, QUEENSLAND, NEW SOUTH WALES, VICTORIA, TASMANIA.

The present species was collected by Mr. Petrie, on Swampy Hill, near Dunedin, but, as it is a common grass in Australia, and having only been found in the vicinity of extensive grass cultivations and of a shipping port, must be considered as a doubtful native until it has been found in other places; nevertheless, as few collectors have given much attention till recently to this family of plants, it may have been hitherto overlooked. Should this grass prove indigenous to New Zealand, it will be necessary, for the purpose of preventing confusion, that the genus *Deyeuxia* be added to the flora, in consequence of *Agrostis parviflora*, a New Zealand species, having been identified with a common North American species, *Agrostis scabra*, Willd, "Flora Australiensis, VII., 576;" and as Hooker, in his arrangement of the New Zealand grasses, has united *Deyeuxia* and *Agrostis*, confusion would arise from having two species with the same specific name. It would therefore be necessary, in any future arrangement, that such an anomaly should be provided for by separating the two genera. DISTRIBUTION OF SPECIES IN NEW ZEALAND: SWAMPY HILL, DUNEDIN—W. Petrie.

Reference to Plate XXVI. 2. : Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Ovary.



Deyeuxia scabra, Benth.

DANTHONIA THOMSONII, n.s.

THOMSON'S NAKED OAT GRASS.

(Plate XXXVI., 2.)

A TUFTED grass, found at 1000—2000 feet altitude. *Flowers* December — January. Perennial. *Culms* 10—18 inches long, erect. *Leaves* 6—7 inches long, very narrow, involute, smooth. *Sheathing leaves* long; *ligule* 0, or a line of short hairs round mouth of sheath, and long cilia on both sides. *Panicle* 2—3 inches long, contracted, open only when flowering, shortly branched. *Spikelets* few, $\frac{1}{3}$ inch long, 6—8-flowered. *Empty glumes* large, longer than the spikelets, 5-nerved. *Flowering glume* glabrous, shortly bifid at the top, with a short central awn, 7-nerved, and with 2 pencils of long hairs on each margin, pedicel with short tufts of hairs. *Palea* bifid, 2-nerved. *Scales* broad, 3-lobed, and crowned with cilia. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This addition to the genus *Danthonia* was recently discovered by Mr. Petrie, on Mount St. Bathans, Otago. It is closely allied to *Danthonia nuda*, differing only in greater size, and the presence of 2 pencils of hairs on each margin of the flowering glume, instead of 1 pencil, as in that species. These characters being constant without intermediate forms necessitates a new name for the purpose of distinguishing these grasses, although, if this grass had been discovered first, *Danthonia nuda* might only have been considered as a small variety. This additional species to that variable group of the genus of which *Danthonia semi-annularis* is the type may be considered as equally valuable in nutrient qualities and bulk as any of the others, and worthy of cultivation. The whole of this family of grasses possess a large butter-producing capacity, the presence of which is easily proved to the experienced farmer, by merely chewing the culms, the flavour of the sap being as satisfactory a test to him as any analysis. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: MOUNT ST. BATHANS, OTAGO, 1000—2000 FEET.

Reference to Plate XXXVI., 2.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.



Danthonia Thomsonii, n.s.

nutrient value will, as with other grasses, prove unequal under the varied conditions of climate and soil found within the extremes of New Zealand latitude. DISTRIBUTION IN NEW ZEALAND: FROM THE NORTH CAPE TO STEWART ISLAND.

Reference to Plate XXXIV. : Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Ovary, styles, and stigmas. 9. Grain.

8.—DANTHONIA SEMI-ANNULARIS. VAR. ALPINA.

ALPINE OAT GRASS.

(Plate XXXIV.2 A.)

DANTHONIA SEMI-ANNULARIS, R. BROWN. VAR. D. ALPINA, Trans. N.Z. Inst., IV., 225.

Culms numerous, 10—15-inches high, found at 3500 feet altitude, covering large patches of land. *Flowers* December—January. *Leaves* nearly as long as the culms, very narrow and involute, pilose; *ligule* as in the species. *Panicule* $1\frac{1}{2}$ -inches long, contracted, shortly branched. *Spikelets* 12—15, $\frac{1}{2}$ -inch long, 5—7-flowered. *Empty glumes* nearly equal, 3-nerved. *Flowering glume* same as the species, with 2 circles of hairs; pedicels tufted with hairs. DISTRIBUTION OF VAR. ALPINA: SOUTH ISLAND, NEW ZEALAND.

This variety of *D. semi-annularis* is an abundant grass on the bald-headed mountains near Dusky Bay, forming a close, fine-leaved pasture above the limits of the bush. The mountains being covered by snow during winter, and its weight bearing so long on the grass, it becomes flattened and appressed to the ground, so as to render it very slippery work walking on the slopes. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: DUSKY BAY — Buchanan; NELSON MOUNTAINS — McKay.

Reference to Plate XXXIV.2 A: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4. Nervation of empty glume. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Ovary, styles, and stigmas.

8.—DANTHONIA SEMI-ANNULARIS, VAR. GRACILIS.

SHEEP OAT GRASS.

(Plate XXXIV.2. B.)

DANTHONIA GRACILIS, Hook. fil., N.Z. Fl., I., 304, t. 69B.

DANTHONIA SEMI-ANNULARIS, R. Brown. Hook. fil. VAR. C. GRACILIS, Handb. N.Z. Fl., I., 333.

A SLENDER, fine-leaved, perennial grass. *Flowers* November—January. *Culms* 12—18-inches high. *Leaves* numerous, very narrow, involute, glabrous or pilose. *Panicle* $1\frac{1}{2}$ —2-inches long, contracted. *Spikelets* $\frac{1}{3}$ -inch long. *Empty glumes* barred, purple. *Flowering glume* pilose on lower half, with a circle of long hairs under the lobes; lateral awns one-third the length of glume; central awn 4-times longer than lateral awns, straight and twisted slightly at bottom; pedicels with tufts of long hairs. DISTRIBUTION OF VAR. GRACILIS: SAME AS SPECIES.

This is a valuable sheep grass, often forming a thick close sward; it might also be cultivated as a lawn grass.

Reference to Plate XXXIV.2. B.: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale.

NOTE.—No specimen of *D. semi-annularis*, Var. B. *Unarede*, is in the Museum Herbarium, and therefore cannot be figured.



A. *Danthonia semiannularis*, R.Br. Var. *alpinus*.
 B. " " " Var. *gracilis*.

7.—DANTHONIA PILOSA, VAR. STRICTA.

HARD OAT GRASS.

(Plate XXXIII.2. A.)

A STRAIGHT rigid grass. *Flowers* November—January. *Culms* 1—2-feet high, rigid, pilose. *Leaves* few, flat or involute, short, pilose, sheathing leaves short. *Panicle* similar to that of the species, but harder. *Florets* glabrous, pencils of hair on back sometimes reduced to one hair, a circle of hairs round the base, awns shorter and less coloured than in the species. DISTRIBUTION IN NEW ZEALAND: SAME AS SPECIES.

Reference to Plate XXXIII.2. A.; Fig. 1. Plant after flowering. 2. Spikelet. 3. Floret. 4. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Palea. 7. Scale. 8. Ovary, &c.

7.—DANTHONIA PILOSA, VAR. RACEMOSA.

RACEMED OAT GRASS.

(Plate XXXIII.2. B.)

A SLENDER drooping grass. *Flowers* December—January. *Culms* 1—2-feet high, weak, glabrous or pilose. *Leaves* few, very narrow, involute or flat, glabrous or pilose, sheathing leaves short. *Panicle* racemose, drooping, with few distant spikelets. *Florets* the same as in VAR. STRICTA. DISTRIBUTION IN NEW ZEALAND: SAME RANGE AS SPECIES.

Reference to Plate XXXIII.2. B.: Fig. 1. Plant after flowering. 2. Floret. 3. Scales, showing their method of growth from the rachis. The rachis of the next flower articulates at the side as a branch in *Danthonia*; the scales appear first as 2, membranous, linear-oblong, obtuse, or tapering leaves, which afterwards split up on the upper part into cilia. The stigmas also of several grasses have been observed to be well developed, before separating from a similar membrane.



A. *Danthonia pilosa*, R.Br. Var. *stricta*.

B. " " Var. *racemosa*.

2.—DANTHONIA OVATA, N.S.

(Plate XXIX. 2.)

A SMALL sub-alpine tussock grass, found at 4000 feet altitude. *Flowers* January. *Culms* $1\frac{1}{2}$ —2-feet high, pilose below. *Leaves* 10—12-inches long, narrow, involute, pilose; *ligule* 0, or with a narrow line of short hairs round the mouth of sheath, and a small tuft of long hairs on each side. *Panicle* 3—4-inches long, erect, ovate; branches alternate, $1-1\frac{1}{2}$ -inches long. *Spikelets* alternate on the branches, $\frac{1}{2}$ -inch long, 4—6-flowered, 2—4 spikelets on each branch. *Empty glumes* nearly equal, 3-nerved. *Flowering glume* deeply 2-fid with lateral awns, 9-nerved, glabrous, fringed on margins and back with pencils of hairs, central awn straight, not flattened or twisted at the base, pedicel tufted with long hairs. *Palea* bifid on top, and with long straggling hairs on the margins. *Scales* linear-oblong, acute, crowned with long cilia. DISTRIBUTION OF SPECIES: NEW ZEALAND.

This is a grass of apparently limited distribution, and of which little is known, but, as the mountainous parts of Southland, where it was discovered, have never been botanically explored, it may probably yet be found abundantly there. The fringed flowering glumes pronounces its affinity to the larger tussock grasses, and the straight subulate awn more particularly to *D. Cunninghamii*, of which it might be considered as only a variety but for the much larger spikelets and long lateral awns of the flowering glume; neither has any variation of that species been seen with a similar panicle, or such short leaves. The value of this grass in pasture is not known, but at the time of flowering it is no doubt eaten by sheep, who spare nothing at these high altitudes during the summer season. DISTRIBUTION IN NEW ZEALAND: SOUTH ISLAND: MOUNT EGLINTON, SOUTH-LAND—J. Morton.

Reference to Plate XXIX. 2: Fig. 1. Plant. 2. Spikelet. 3. Floret. 4, 4'. Nervation of empty glumes. 5. Nervation of flowering glume. 6. Nervation of Palea. 7. Scale. 8. Ovary, pistils, and stigmas.



Danthonia ovata, n.s.

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